



FRIDAY, JANUARY 22, 1897.

CONTENTS

ILLUSTRATIONS:	PAGE.	GENERAL NEWS:	PAGE.
A Hydraulic Dynamometer.....	56	Railroad Law.....	69
The G. E. Electric Brake for Street Railroads.....	58	Meetings and Announcements.....	69
A Good Run on the Chicago, Milwaukee & St. Paul.....	59	Personal.....	70
Intercepting Valve—Great Southern & Western Locomotive.....	60	Elections and Appointments.....	70
The Slide-Rule as an Aid to Railroad Field Work.....	60	Railroad Construction.....	71
The Fatigue of Wrought Iron and Steel.....	66	Electric Railroad Construction.....	71
		General Railroad News.....	72
		Electric Railroad News.....	72
		Traffic.....	72
CONTRIBUTIONS:		MISCELLANEOUS:	
Conflict of Opinion.....	55	Technical.....	67
A Convenient Moment Table.....	55	The Scrap Heap.....	68
EDITORIALS:		Railroading as a College Course.....	55
The Nicaragua Canal.....	62	North Carolina Railroad Commissioners' Report.....	55
Railroad Earnings in 1896.....	62	Compressed Air in Railroad Shops.....	57
Standard Dimensions for Interchange Box Cars.....	63	Standards for Box Cars.....	58
Annual Reports—Lehigh Valley.....	64	Specifications and Inspection of New Rolling Stock.....	58
Proposed Railroad Legislation.....	65	The Teaching of Railroad Mechanical Engineering.....	59
EDITORIAL NOTES.....	62, 65	Michigan Railroad Commissioner's Report.....	59
New Publications.....	65	Deep Waterways from the Lakes to the Sea.....	59
Trade Catalogues.....	65	Kansas Railroad Commissioners' Report.....	61
GENERAL NEWS:		Apprenticeship in Machine Construction.....	66
Locomotive Building.....	68	American Society of Civil Engineers.....	66
Car Building.....	68		
Bridge Building.....	68		

Contributions.

Conflict of Opinion.

Jan. 14, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read with a great deal of interest your recent editorial in the *Railroad Gazette* Jan. 1 on the work of the Interstate Commerce Commission. I notice, however, that the people of the country are not all of one mind regarding the Commission or its work, as shown by the clipping enclosed:

At its annual meeting in St. Paul the Minnesota Farmers' Alliance adopted several sensational resolutions. One of these is:

"We denounce the administration of the Interstate Commerce Commission as a fraud upon the country, regarding that body, as we do, as very little more than a pension bureau of superannuated politicians or complaisant political tools."

The Commission seem to be rather between the upper and the nether millstones—"you'll be damned if you do and you'll be damned if you don't."

A FRIEND OF COMMISSIONS.

A Convenient Moment Table.

CHICAGO, Jan. 12, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The moment table published by Mr. Condon in your issue of Dec. 25, and referred to as a modification of one in use in my office, is older than assumed by the Osborn Company in its communication published in your issue of the 8th inst. Moment tables of this description were used by the writer during the period 1874 to 1878, when he was employed as bridge engineer on the Cincinnati Southern Railway. The specifications of that company provided for a moving load consisting of two locomotive engines at the head of a uniformly distributed freight load. The wheel loads of the engines and the spacing of the wheels were given.

The strain sheets submitted by bridge companies bidding under these specifications were all calculated by adopting a uniform load with or without a single engine-excess at the head supposed to be approximately equivalent in effect to actual wheel loads specified. It was the writer's duty to recalculate these strain sheets, and he did so on the basis of the actual wheel loads placed in positions giving maxima of strains, with results very different from the figures given on the strain sheets. It was in this connection that these moment tables were first used, and the bridges on the Cincinnati Southern were probably the first in this country which were proportioned for actual engine wheel loads.

As showing the increase which has taken place since that time in the weights of engines, it may be mentioned that the engines specified weighed, including tender, 66 tons, and the freight load was 1,800 lbs. per foot, and these loads were thought to be excessively heavy at that time.

The writer cannot claim originality for these moment tables, as corresponding tables were used by Professor Mohr (now of the Dresden Polytechnic School, Germany), and the writer's teacher in applied mechanics) in connection with his graphical methods of calculating strains in bridge trusses. The writer eventually used these tables, however, without the diagrams. He became Chief Engineer of the Keystone Bridge Co. in May, 1878, and introduced these tables there. It is to be noticed that Mr. Condon does not claim that these tables are new, and presumably his purpose in calling attention to them at this time was the fact that they are not even now generally in use.

C. L. STROBEL.

Railroading as a College Course.

The appearance of several articles in recent issues of the *Railroad Gazette* on the practicability of training men for the higher position in the railroad service has suggested the thought that a few paragraphs giving the experience and attempt of one who has endeavored to obtain such a course would add to the interest of the discussion.

I entered the Civil Engineering Department of a Western college. Three years were spent on the usual studies. This included: Two years good grounding in the higher mathematics; sufficient French and German for a workable reading knowledge; an introduction to political economy; several courses in mechanics and electricity, with the usual laboratory work; a good elementary introduction to hydraulics and the theory of framed structures, including graphic statics with a course on surveying and railroad instrumental work. The fourth and last year would have been spent in an elaboration of the engineering part of the course with some little specialization in one branch of work elected by the student. In conversation with one of the professors of the department, I ventured the remark that there seemed to be little financial reward in engineering pure and simple; to which he replied that he could not speak as an authority on that subject since he had never made a dollar out of the profession other than as a teacher of it.

I determined to forego this last year of engineering work and devote my time exclusively to giving myself a course in railroading, and I immediately outlined what I considered essential. I had no guidance, and the suggestions offered me in the matter were somewhat facetious. One professor in the department suggested that I start in with some road as a switchman, since in his experience he had known a switchman who had risen to be a yardmaster. It is proper to state that the idea of giving myself a course in railroading would never have occurred to me had I not been in the neighborhood of the Hopkins Railway Library, which is recognized to contain an unequalled collection. My course of study comprised:

1. Railroads—History of Their Inception in England, America and France.
2. Types of Railroads.
3. Transportation.
4. Railroad Economics.
 - (a) Railroads and Geographical Position.
 - (b) Theory of Rates.
 - (c) Periodic Traffic.
 - (d) Railroad Location.
5. Railroad Commissions.
6. Law—Elementary.
 - (a) Master and Servant.
 - (b) Eminent Domain.
 - (c) Corporation Law.
7. Organization.
 - (a) Receiverships.
 - (b) R. R. Clearing House.
8. Railroad Expenses.
9. Trades Unions—Strikes.
10. Motive Power.
 - (a) History of the Locomotive.
 - (b) Fuel Economy.
 - (c) Stationary Engine.
 - (d) Water Supply.
11. Equipment—Utilization.
12. Train Resistance.
 - (a) Brakes.
 - (b) Speed Changes.
 - (c) Wheels and Axles.
 - (d) Rails.
13. Railroad Structures.
 - (a) Yards and Terminals.
 - (b) Depots.
14. Maintenance of Way Standards.
15. Signalling.

The first topic, "Railroads, History of their Inception," took me into old British Blue Books, giving the parliamentary discussion on the franchise for the Liverpool & Manchester in 1828, and into the fanatical pamphlets written by railroad promoters, who thought that that steam transportation would be so cheap that it would pay to take down the mountains of England and dump them in the sea in order to increase the agricultural area of Great Britain. In the United States the inception of the Baltimore & Ohio supplied a typical case and its development from the time its engines ran races with Paddy Ryan's fast grey mare formed an interesting study.

It has perhaps never occurred to a large number of railroad men that many types of road have been suggested and many forms of power. It took many years of discussion during the thirties for the agitation in favor of steam road carriages on highroads to give way to the specialized railroad track. A review of this agitation and of single-line railroads, rack railroads and moving platform railroads came in under subject 2.

The most arduous and tedious work came with subject 3. It is inconceivable how varied the lines of investigation become when "Transportation" is taken up. Its history, development and influence on communities make the study co-extensive with human endeavor, and when, added to its extent, one pursues the study through the tediousness of such a volume as Sax's *Verkehrsmittel* it becomes burdensome.

"Railroad Economics," as subject 5, was the most attractive. The mass of good literature on the subject made it an easy task to rapidly get an elementary knowledge of the subject. The first material attacked on this subject were the reports of the Hepburn and Cullom committees. These contain a mine of information on the subject. Following this came desultory reading from Hadley's *Transportation* to Ulrich's *Eisenbahntarifwesen*; from Dr. Lardner's *Railway Economy* of 1856 to Gournier's "L'Exploitation des Chemins de Fer." Under this head came in a somewhat extensive study of the transformation of the economic and geographical relations produced by the introduction of railroads. This

opened up an almost illimitable group of side studies. Before the advent of steam transportation the economic relations of one community to another were settled and their geographical advantage and disadvantage were well understood. But with the possibility of new transportation routes all these economic and geographical relations became modified, so that districts and communities having natural advantages as centers for transportation would have to compete with the artificial center of transportation created by the new system.

The theory of rates was taken up as an allied subject and an immense amount of dry-as-dust literature was consulted on the subject of "Cost of Service" and "Value of Service" as a basis for rates, and much valuable time was spent in foolish efforts to develop a formula for rate making which would be a constant for the million variables which must ever enter as factors in a rate. Somewhat extensive tables and traffic curves were prepared when "Periodic Traffic" was taken up. This proved to be one of the most interesting topics of the whole course. Railroad location was made somewhat difficult by the voluminous and tedious literature on the subject, some of the best of which is found in the monographs of the *Archiv für Eisenbahnwesen* and in Launhardt's *Theorie des Trassierens*. A review of amalgamations and pools was taken up as being allied to the economics of transportation and the British Blue Books were consulted for their valuable discussions on these subjects. Money pools and traffic pools were found to be in full force so early as 1844. The reports of the American Traffic Association were also reviewed for information on the same subject.

Railroad commissions were next taken up. The library above referred to contains complete files of commission reports, and a study of their prefaces and findings proved very valuable. A comparative study of the powers delegated to these commissions and of the constitutionality of these powers as determined by the courts succeeded in giving a somewhat comprehensive view of their value as regulators of transportation.

Law as subject 7 does not now appear to be closely allied to a railroad course, but at the time a knowledge of the legal relations of master and servant seemed imperative.

With subject 8: Organization came in a comparative study of the organization of the different departments of several large systems. A complete collection of stationary and blank forms for all the business of a large railroad corporation, comprising between 700 and 800 different forms, was at hand; these were carefully reviewed, and it resulted in giving a fairly comprehensive idea of the magnitude and vastness of a road's organization. A study of the working of the English Clearing House was taken up in this connection, and also of the attempt to establish a miniature copy of the same in New England.

Railroad expenses as subject 9 proved to be the most laborious study of the whole list. It was laborious because it was valueless unless carried out in an exhaustive way. Any one who has ever attempted to compile table and statistics from the annual reports of railroad companies and the reports of railroad commissions knows how arduous the labor becomes. Nevertheless, comparative tables were prepared from these reports showing train load, fuel consumption and fuel cost per train load; cost of engine and car repairs; mileage of locomotives; cost of rail and tie renewals; the extent to which the equipment was utilized; the effect of grade and curvature on expenses and a dozen other allied subjects, the whole study under this head being worked up into a thesis of some fourteen thousand words.

Subjects numbered 10 to 15 explain themselves. This list comprises the course which I afterward found I had given myself. It had not been developed beforehand, but unfolded itself as I went from subject to subject. It was a haphazard study, an experiment pure and simple. I refrain from giving the results of this course, which was completed two years ago, since they have not been entirely satisfactory, but of this I am convinced—I would give myself the same or a similar course again if I were to begin once more. It would be foolish to suppose that such a course as the above gives one judgment or fits one for administrative work. This fitness must come with years of experience in finding adequate means for given ends, and in the formation of rapid and accurate decisions. This much, however, is claimed for it; the best and most accurate judgments can only be formed when all the facts are known; good judgments on limited knowledge are about as valueless as bad judgments. Railroad courses in college will not supply good judgments for the railroad service, but they might be arranged to supply men having an extensive knowledge of railroad facts, without which knowledge satisfactory judgments cannot be made. R. L. DONALD.

North Carolina Railroad Commissioners' Report.

The Railroad Commissioners of North Carolina, J. W. Wilson, E. C. Beddingfield and S. O. Wilson, have issued the sixth annual report of the Board. The length of new railroad constructed in the state during the year was 39 miles, making the total mileage in the state 3,445. The taxable valuation for the year 1896 was \$26,576,097, an increase of about \$1,500,000 over the previous year. The number of complaints has been very small. The Commissioners present a statement showing that the railroads of North Carolina, carrying passengers at 3½ cents a mile first-class, and 2½ cents a mile second-class, are giving the public better rates than are obtained in Pennsylvania or Massachusetts, considering the den-

sity of the population, or on the Chicago, Milwaukee & St. Paul. Further comparisons are given showing that many railroads with traffic no thinner than that in North Carolina charge higher rates. The average receipt per passenger per mile of the principal lines in the state is 2.21 cents, while the average for the whole group (group 4) is 2.302. Comparison is made with the high rates charged between New York and Washington. A table is given showing the local passenger rates on three principal railroads in each of 17 different states. In ten of these states, Alabama, Arkansas, Georgia, Illinois, Iowa, Mississippi, Ohio, Pennsylvania, Tennessee and Texas, the rate is 3 cents; in Florida it is 4 cents, in Kentucky 3 cents, except that the Louisville & Nashville charges 4 on some lines. In Louisiana 3 cents is the prevailing rate, but the Southern Pacific charges 4 and 5 on branches. In Massachusetts the Boston & Albany charges 2½ cents, the New York, New Haven & Hartford 2¼, the Fitchburg 2¼ and 2½. In South Carolina the first-class rate is 3¼ and the second-class 2½. In Virginia the prevailing rate is 3 cents, but the Norfolk & Western receives 3½ on some lines.

This report is three times as large as the last previous one, but that consisted of only two pages. The remainder of a thick volume, both last year and this, is filled with individual reports of companies, the official state freight classification and other things.

A Hydraulic Dynamometer.

Prof. James D. Hoffman, of the Mechanical Department of Purdue University, has constructed a hydraulic dynamometer with which he has made a series of tests on the application of cutting edges to iron and steel, the dynamometer being used to measure the work done under various conditions.

This machine was constructed at Purdue University in the winter of 1894 and has been in use since September, 1895, giving some very valuable results. It was used by the Master Car Builders' Committee on laboratory tests of brake shoes in determining the relative hardness of different grades of cast iron and steel used.

Figs. 1, 2 and 3 show the main features of the dynamometer. This machine consists essentially of a hollow shaft, mounted in suitable bearings carried by the framework, which in turn carries three pulleys, A, B and C (Fig. 2), and a casting to which two cylinders are fastened by means of a double yoke and trunnions. These cylinders E, E' (Fig. 2), are diametrically opposite

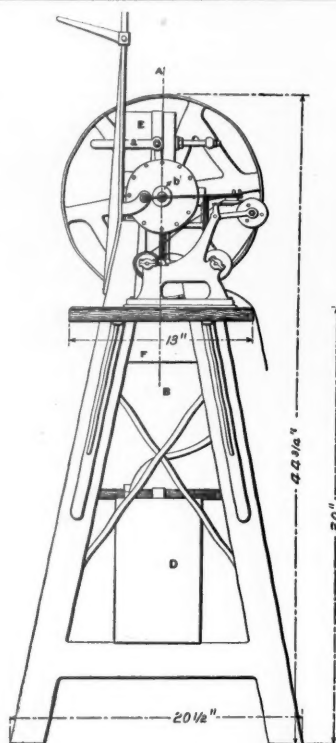


Fig. 1.

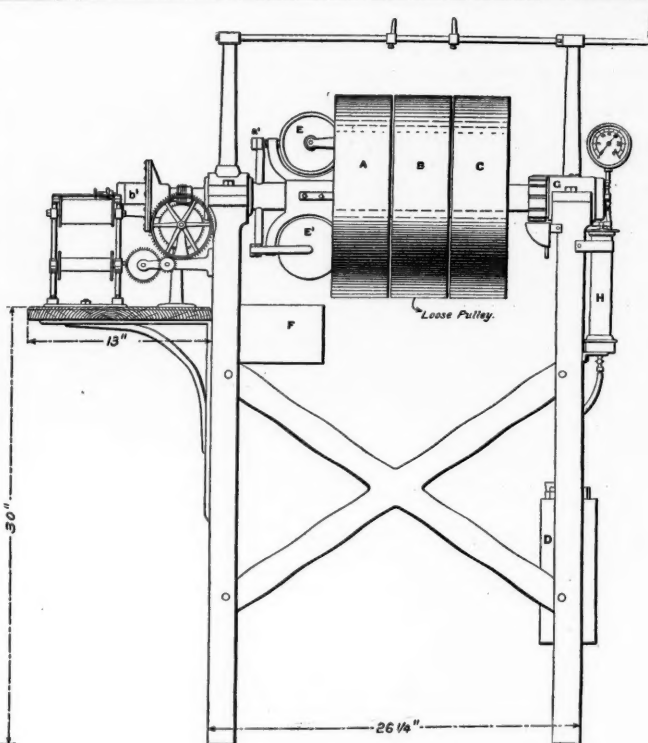


Fig. 2.

and that any variation in this resistance will be shown immediately by the gage and recording pencil.

Figs. 1, 2, 3 and 4 show the arrangement of the recording apparatus. The machine is self-registering. The recording pencil consists of a bronze point attached to the piston, *f*, by means of a series of arms, so that a true straight-line motion is produced. The record is traced on metallic-surfaced paper carried by a drum, which is driven by gearing from the shaft. The speed of the drum can be varied by a system of interchangeable gears. No cup leathers are used on any of the pistons, and the leakage of oil is very slight and has

C, and shown in Fig. 5. Known weights were hung at measured distances along the arm, and the distance from the axis of the shaft to the point of application being known, the turning moment could be determined. The area of each cylinder is 10 sq. in., and the radius of the path described by the center of the cylinders equals 3.82 in., so that the pressure per square inch could be calculated without reference to the gage. This method showed the dynamometer constant to be .345 in., as compared to .344 in., as obtained with the gages.

To insure the pencil returning each time to the same line when the load is removed, a constant pressure is put

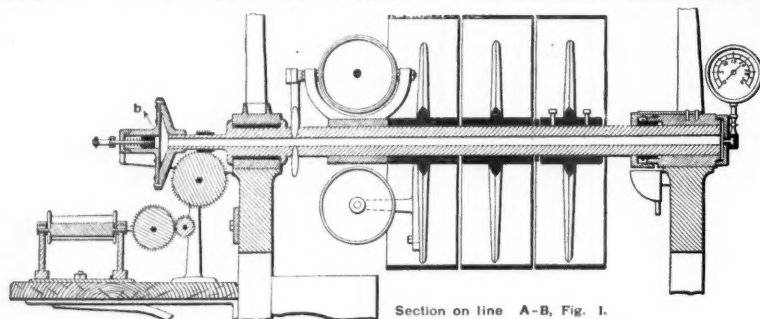


Fig. 3.

Section on line A-B, Fig. 1.

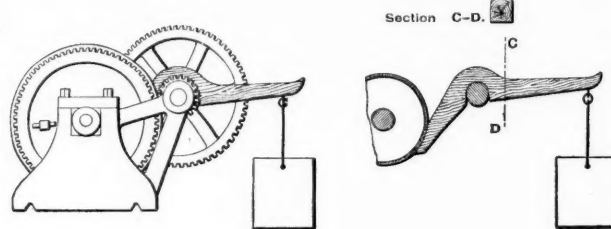


Fig. 6.

each other, are exactly of the same size and similarly placed with reference to the shaft, so that the balance is maintained. The pistons, working within the cylinders, are connected by ball and socket joints, the links which are fastened to projections on the loose pulley A, thus allowing the cylinders a slight vibratory motion on the trunnions.

A brass tube connects the interior of each cylinder with the opening in the shaft. To allow for the slight motion of the cylinder a ground joint is made in this connection at *a* (Fig. 2).

As shown in Fig. 3, the shaft is hollow throughout its entire length. At one end is fastened a casting *b* provided with a small piston working against a spring; to this piston is attached the recording pencil. This casting being connected to the shaft, turns with it, but the piston is kept from turning by means of the frame which carries the recording pencil.

At the opposite end of the shaft is attached a pressure gage and oil-pump *H* (Fig. 2). There is also a stuffing box at this end, allowing the oil in the shaft to lubricate the bearing and still preventing its escape. By means of the pump the hollow shaft, cylinders and pipe connections are filled with oil, and in case of leakage it is used to replace what is lost.

Pulley A, shown in Fig. 2, is loose on the shaft except for its connection by means of the pistons already described. This pulley carries the belt driving the dynamometer. Pulley B is loose on the shaft, and carries the driving belt when the dynamometer is not in use, while pulley C is fixed to the shaft and from it is run the machine to be tested.

The action of the dynamometer is as follows: The pull of the belt on pulley A is transmitted through the links to the pistons. This produces a pressure on the oil in the cylinders and shaft, which pressure is transmitted without loss to the piston operating the recording pencil, and is also shown by the pressure gage. As the cylinders are connected to the shaft, it is made to rotate with pulley A, along with pulley C, which drives the machine being tested.

It is evident that the pressure of the oil is dependent upon the resistance to turning offered by the pulley, C,

been found to have no appreciable effect on the results.

The movement of the registering pencil being dependent upon the spring placed back of the recorder piston, before tests could be made it was necessary to calibrate the dynamometer carefully. This was done in two ways.

Fig. 4 shows the machine as fitted for calibration by the first method. The pulley, A, was held stationary by means of a wire running to the floor. A lever was attached to the pulley, C, so that by applying a load to the lever any desired pressure could be obtained in the cylinder. The pressure gage attached to the machine was first tested in the laboratory, and was brought to read exact pounds by applying loads to the lever. When

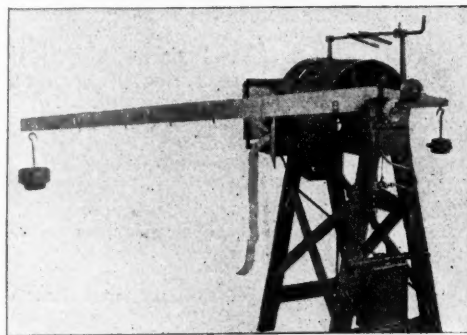


Fig. 5.—Hydraulic Dynamometer.

at these points the paper was moved, giving lines parallel to the base line, this operation was repeated with a second gage, and the average of the two sets of readings showed the constant of the spring, and hence the dynamometer to be .344 in., vertical, on the paper, equal to a pressure of 1 lb. per square inch.

As an additional check the second method was used. This made use of a differential arm attached to the pulley

on the spring when the piston *b*, Fig. 3, is against the stop. A stationary bronze point is set to record this line, and all measurements are taken from it. The zero line is below this base line a distance readily determined when the scale of the spring is known.

The dynamometer has been found to be possibly more accurate when operated by differences; that is, by taking a card of the machine (lathe or planer) in motion without cutting and a card with the tool in operation. The difference in the height of the cards is evidently due to the action of the tool. If the friction of the machine and work (without cutting action) is not sufficient to move the pencil from the base line under the compression of the spring used, a device for weighting the back gears of the lathe is introduced as shown in Fig. 6.

A few sample cards are given to show how readily the recording device responds to slight changes in the power transmitted.

Fig. 7 is a reproduction from cards taken from an 18-in. lathe, while turning machine steel, wrought iron and cast iron, and shows the gradual reduction in the height of the card as the diameter of the stock decreases, also the relative heights of cards from the different metals. The cards at *F*, *G* and *H* are friction cards. Figs. 8 and 9 show the effect of sand holes in a casting. The cutting edge of the drill was dulled, as indicated by the increased height of the card after passing the sand hole.

Fig. 10 was taken while turning machine steel. The tail center proved to be too tight, and from *a* to *b* shows an increase due to the grooving of the center. At *b* the pressure was removed. Fig. 11 shows a card taken on a milling machine. The upper card shows the effect of running with the cutter out of center. The lower card shows the same work done with a true cutter.

Fig. 12 illustrates the action on a shaping machine. The change shown between the cards marked *A B* and *B C* is due to increasing the feed. That shown between *B C* and *C D* is due to cutting with and without lard oil, while the difference between *E F* and *G H* is that of the machine running empty, with and without the feed. *I J* and *J K* show a similar effect when planing wrought iron with the feed in and out.

Trials have been made so as to determine the weight of various metals removed per hour and the corresponding horse-power required to drive the machine. In finding the weights of metal removed per hour, the constants .26, .28 and .284 were used as the weights of one cubic inch of cast-iron, wrought iron and steel respectively. The feed was retarded slightly in the harder metals in the proportion of 1.48 for cast iron, 1.45 for wrought iron and 1.4 for steel, of the travel of the tool in inches per minute.

These tests gave the following as the relation existing

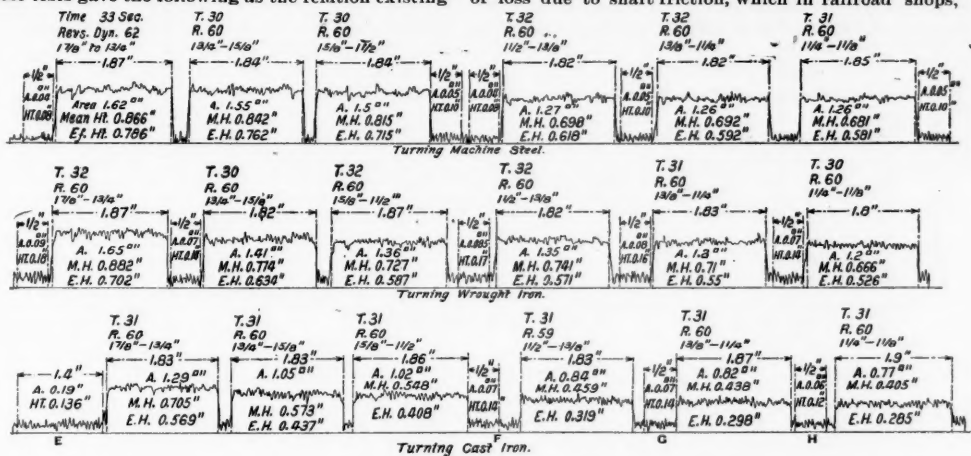


Fig. 7.

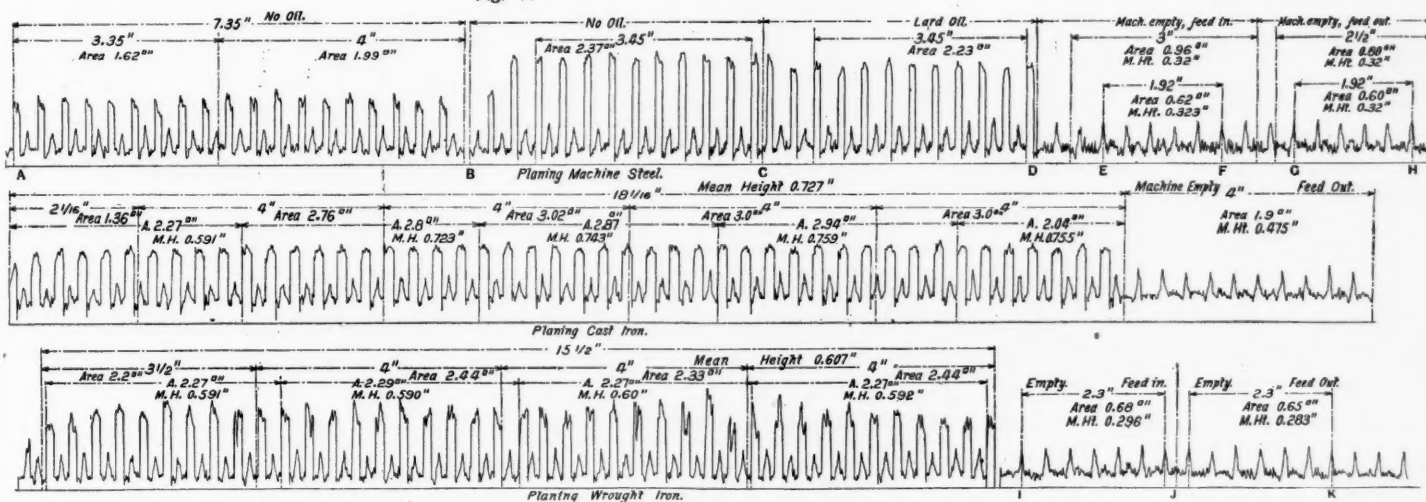


Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Sample Cards Taken from Hoffman's Hydraulic Dynamometer.

between the weight of chips removed per hour and the horse-power used: Horse-power equals .039 W for steel, .0347 W for wrought iron and .021 W for cast iron.

Comparing these results with those of Hartig and Smith, the values of the constant C in the formula $H. P. = C W$, are as follows:

	Cast iron.	Wrought iron.	Steel.
Hoffman	.021	.0347	.039
Hartig	.030	.032	.047
Smith	.023	.028	.042

The average pressure at the point of the tool was found

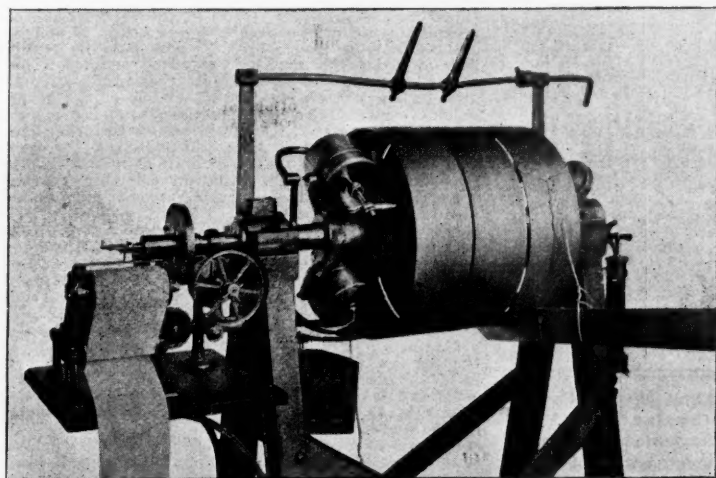


Fig. 4. Hoffman's Hydraulic Dynamometer.

to be: Cast iron, 192 lbs.; wrought iron, 337 lbs., and steel, 371 lbs

Compressed Air in Railroad Shops.

BY PROF. J. J. FLATTIER, *Purdue University.**

In the use of compressed air the faculty of adaptation to various requirements, shown by Mr. McConnell, and which are in many cases additional to the supply of motive power, is a valuable feature peculiar to this system, and one which is susceptible of extension along many

lines. The labor cost in most machine shops is so much greater than the cost of power that any expedient by which the labor cost may be reduced is justified, even though the efficiency of the agent itself be low.

The saving of power is a consideration secondary to the advantages and economical output obtained by its use. This is very forcibly illustrated at the present time by the enormous increase in the use of compressed air and electricity in various mechanical operations. While economy in the use of power should be secondary to increased output, yet careful attention to details will often greatly reduce the useless waste of power. Engineers are beginning to realize the very great percentage of loss due to shaft friction, which in railroad shops,

per cent.—an exceptionally small value; 15 per cent. is nearer average good practice, and 30 per cent. is not uncommon. In addition to this heat loss there is the friction loss of the compressor which varies from 12 to 20 per cent. and even more than this in some of the older inefficient machines.

The other sources of loss are those due to heating the air previous to and during its admission into the compressor: insufficient air supply, and losses due to clearance and leaks. The free air which enters the compressor should be drawn from outside the engine room where the air is cool; in the same way, contact with hot surfaces during inlet should be avoided. An increase from 60 deg. to 100 deg. Fahr. means a loss of 7 per cent. in

where the buildings are more or less scattered, is probably not far from 75 per cent. of the total power used. In two cases known these losses are 80 and 93 per cent. respectively. No matter how well a long line of shafting may have been erected, it soon loses its alignment and the power necessary to rotate it is increased.

Independent motors are often employed to drive sections of shafting and isolated machines. Among these are steam engines, electric motors and compressed air motors, although the latter have not been used for this purpose to any extent in this country. For isolated machines and for heavy machines that may be in occasional use, the electric motor is particularly well adapted as a source of power, for such a means of transmission consumes power only when the machine is in operation. This is true also of compressed air, and we find numerous instances where it has entirely replaced steam even in large work. Thus at the steel works at Terni, Italy, a 100-ton hammer is worked by compressed air and also two large cranes having a capacity of 100 tons and 150 tons respectively. In Paris also, according to Professor Unwin, compressed air motors are even used to drive dynamos for lighting theaters and other buildings. At some of the news-paper offices there are motors of 50 and 100 H. P. driving presses; and in shops and factories these motors are used to run lathes, saws and various other machines. Compressed air is also used extensively to operate pumping machinery.

In the compression of air with steam actuated compressors, there are various sources of loss which in aggregate will vary from 25 to 45 per cent. of the total power of the machine. The principal loss is usually that due to heating the air during compression. If the air is not cooled during compression by some external means the compression curve will be adiabatic; on the other hand if the temperature of the air be kept constant the curve will be isothermal, in the first case a certain amount of useless work will be done in heating the air, which necessarily become cooled during transmission, so that while the pressure remains practically the same, the volume will be reduced. This loss becomes greater as the pressure increases. If, however, the air be carefully cooled during compression the loss will be diminished. In tests made by Professor Reidler on two stage compressors in which the air was passed through an intermediate cooler before final compression, the loss, due to heating, under a gage pressure of 75 lbs., was only 11

the volume of air delivered. Ordinarily this need not be large and may be taken at 4 per cent.

Clearance causes a loss of capacity owing to the wasteful space occupied by the air which is not discharged. Theoretically there is no loss of efficiency due to compression in the clearance space, since the work is given out on the return stroke, yet there is indirectly a loss due to work done in overcoming friction while the air expands to atmospheric pressure.

Taking the efficiencies corresponding to the above we have for the average efficiency of a good air compressor working under constant load at a gage pressure of 70 to 85 lbs., about 65 per cent. In the transmission of air, within reasonable limits, the loss in transmission need not be considered. The velocity of flow of air is entirely different from that of water—its friction resistance being less than one per cent. of that of water. With pipes of such an area that the velocity of air does not exceed 25 to 50 ft. per second the loss of pressure would be inappreciable in any ordinary shop transmission. Professor Unwin states that in the Paris mains the frictional resistance of air with a velocity of 25 to 30 ft. per second, and a pressure of six atmospheres, amounted to less than 2 lbs. per square inch per mile. With air transmission there is a corresponding increase in volume for a loss in pressure, so that the loss is practically inappreciable.

The greatest loss of efficiency is that in the motor. The action of an air motor is just the reverse of that of an air compressor; as the air under pressure expands while doing work it loses its heat very rapidly and unless the air be re-heated before it enters the motor the full benefits of expansion can not be obtained. It is impracticable to re-heat the air with any degree of economy when employed intermittently and we find, almost without exception, that the air is used at normal temperature for the various purposes to which it is applied in and about railroad and other shops. Experiments by Professor Reidler, and others, with small air motors (1 H. P.), in which the air is not re-heated, shows the loss in the motor to be about 65 per cent. when the air is used without expansion. With better designed motors and air expanded from 68 deg. Fahr. down to 54 deg. Fahr. the loss with a 2 H. P. motor was only 33 per cent. By re-heating the air to 140 deg. Fahr. and expanding down to 38 deg. Fahr. the loss was 35 per cent. With a larger motor, which was a made-over steam engine of 80 H. P., the air at a pressure of 79 lbs. was heated to 300 deg. Fahr. and expanded to 90 deg. Fahr. with a resulting efficiency of 81 per cent. In this case the cylinder was jacketed with the hot air, which accounts in part for the relatively high efficiency. These results and others would indicate that compressed air as now used is not at all efficient as a source of motive power since the combined efficiency of compressor and motor at constant load, even under favorable conditions, is not more than 50 per cent. of the available energy put into the compressor. In other cases the efficiency is as low as 20 per cent.

In regard to the cost of the power thus obtained from compressed air, in the small inefficient motors, tested by Reidler, the air consumption was about 1,600 cu. ft. per brake horse power per hour; but in the larger motor when developing 72 H. P. the air used was somewhat less than

* Extracts from paper presented before the West End Railway Club, November, 1896.

500 cu. ft. per brake horse power per hour. Assuming 5 lbs. of coal per horse power hour and its cost \$3 per ton, the fuel cost of producing the air will be about 3 cents per 1,000 cu. ft., so that in the first case the power cost as determined by fuel consumption amounts to nearly 5 cents per horse power hour; and in the second case the cost is about 1½ cents per horse power hour. It will be understood that the actual cost can only be obtained when cost of plant, labor, insurance, taxes, repairs, depreciation, and other expenses are known. In any case, the cost will vary with the steam consumption at the steam end of the outfit; for this reason, where the capacity of the compressor is not large, a belt compressor whose motive power is obtained from a more economical engine will give better results as far as cost is concerned; but with its use a valuable feature is sacrificed since we are unable to use the air unless the larger driving engine be in operation.

There should be no comparison between the cost of transmission of power by compressed air and its brilliant pseudo-rival, electricity, since each has its own field of usefulness; yet it may be interesting to note, for our present purposes, the efficiency of electric transmission. A modern generator belted from an engine will have an efficiency of about 90 per cent. when working under favorable conditions, but as the average load is ordinarily not more than two-thirds full load, and often much less, the efficiency will not usually be more than 85 per cent. Since the engine friction was added to the losses in compression so also it should be considered here, in which case the efficiency of generation will be between 75 and 80 per cent. With a pressure of 220 volts, which is very suitable for ordinary shop transmissions when both light and power are to be taken off the same dynamo, the loss in transmission need not be more than five per cent., so that the efficiency at the motor terminals will not be far from 75 per cent. With motors running under a nearly constant full load the efficiency of the motor may be 90 per cent.; but with fluctuating loads this may fall to 60 per cent. at quarter load. Numerous tests show that the average load on motors in machine shops is only about one-third of the rated capacity of the motor.

It is interesting to note that in recent tests made at the Baldwin Locomotive Works it was found that with a total motor capacity aggregating 200 H. P., a generator of only 100 H. P. was sufficient to furnish the current, and ordinarily only 80 H. P. was required. Under these conditions when the driven machines are not greatly over-motored we may assume a motor efficiency of 80 per cent., which may be less or greater in individual cases. The combined efficiency, then, of generator and motor working intermittently with fluctuating loads, will be about 75 × 80 or 60 per cent. of the power delivered to the engine. For greater distances than those which obtain in plants of this character the loss in transmission will be greater, and higher voltage must be employed in order to keep down the loss; while it is possible to put in conductors sufficiently large to carry the current with any assumed loss, yet the cost of the line soon becomes prohibitive with low voltage.

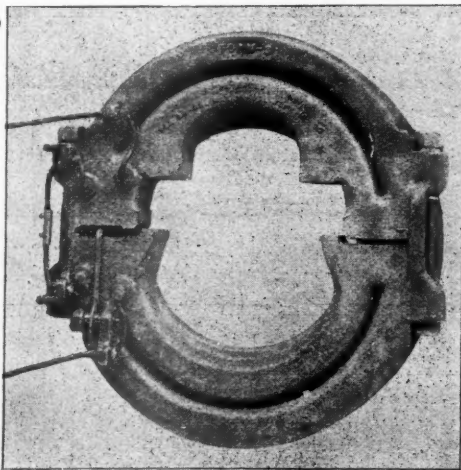
In work of this kind it is well to remember that while the efficiency may be very high the economy may be very low, and good engineering is primarily a question of good economy all things considered. It is not the most efficient plant which produces the greatest economy.

Standards for Box Cars.

Some weeks ago we noted the attempt of the Ohio Falls Car Manufacturing Co., of Jeffersonville, Ind., to start the movement for standardizing many parts in car construction. As we have recorded in other issues, this project has met practically no encouragement in the various railroad clubs, which, perhaps, have felt obliged, officially, to be conservative. We are informed, however, that the company has had greater support than was expected in the way of individual expression on the part of railroad officers and car builders. It seems to be the judgment of a majority of those who have expressed

in giving this description, to repeat in part the explanation given in our issue referred to above.

The brake mechanism is readily attached to the motor and axles. It consists of a cast iron disk shown by the accompanying illustration, which is keyed to each axle, and a compact electro-magnet facing each disk and attached to the motor frame. The maximum current in the brake circuit is regulated by a limit switch adjusted to automatically limit the current to an amount just under the slipping point of the wheels. The brake pressure can be graduated independently of this switch by the controller handle and a smooth motion secured on grades. The disk and shoe are lubricated by a graphite brush carried in the shoe and pressing against the brake disk. This prevents excessive wear from friction and reduces the resistance between the shoe and disk, an



Cast-Iron Disk of the G. E. Electric Brake.

important feature, as the eddy currents set up in the brake and shoe, are even more effective in stopping the car than the simple friction between the shoe and disk.

The principle on which its action depends is to get the braking effect from the motor itself by turning it into a special dynamo run from the axle; that is, the energy stored in the moving car is utilized in developing the braking force. Thus the brake does not depend on the current through the trolley. In this arrangement the controller not only controls the motors, but at the same time operates the brake, starting, accelerating, retarding and braking the car. When making a stop, the controller handle is thrown from running to braking position. The operations are: (1) Cutting all connection with the trolley current; (2) the conversion of the motors into special dynamos for generating current at very low speeds; (3) the application of the brakes. The rheostats and contacts used to control the motors in running the car also control the current generated by the motors and needed to apply the brake.

The braking action is twofold. The rotating armature of the motor, instead of tugging ahead, is pulling back and more or less powerfully braking the car

the specifications for iron and steel, for brass and bronze, springs, lumber and paint. Speaking of journal bearings he said that specifications should require complete tests of these by the standard gages of the M. C. B. Association, as well as chemical analysis. Concerning the joints and surfaces of body frames, he said they should have a protective coating which will exclude moisture, for which purpose many wood preservatives are on the market. Specifications should require all joints to have one heavy coating of such preservative before putting together or covering in. The conclusions of his paper with regard to specifying certain makes of material or certain patented articles, and with regard to the inspection in general, we quote in full below:

"Much has been written and said both for and against the practice of tying up specifications by requiring the use of certain specific makes of material, or certain articles. I wish to add a few words in defense of this practice. Oftentimes a special make of goods is called for. This may arise from two or three very justifiable reasons. It is the seemingly wise policy of some railroad companies to do all they can to foster, encourage and build up the various manufacturing interests on their own lines, or in their immediate territory. By so doing the railroad is indirectly working for its own interests, for increase of such industries means increased business and revenue for the railroad; and other features, such as quality and price of goods, being equal, or nearly so, a railroad company would surely be working for its own best interests by giving such business as it can control to the manufacturers in its own territory, who will be able to reciprocate by giving much of their business to the railroad.

"Experience is a good teacher. All railroad companies do more or less of experimenting. If these experiments are rightly conducted, and careful data are kept concerning them, they generally clearly show the comparative values of the different kind of materials tested. Where experience has shown a certain make of material is better than others, it would be a very short-sighted policy not to specify the best, even though it made the unfortunate losers say unkind things about such action.

Oftentimes a standard has been adopted as a result of earlier experiment, and as a consequence a large percentage of equipment is fitted with this standard. It would surely seem to be pure policy, and in most cases unjustifiable to frequently change or drop such good and tried standard articles and turn to another perhaps untried one, involving, as it would oftentimes, new drawings, patterns and forms, as well as the maintenance in many cases of a supply of additional repair parts at all shops and at many outside points. Only fairly good standard well adhered to is better than four or five different styles of devices, none of which can be called standards. The practice of taking up and experimenting with every new device or alleged improvement is a somewhat dangerous and expensive one, and a conservative policy in this respect will in the long run prove the most safe and satisfactory.

"There seems to be a tendency on the part of some railroad mechanical officers to manufacture at their own shops as many of the articles used in their construction as possible. Is this a wise policy? I believe not. With the multitudinous duties devolving upon superintendents of motive power or master car builders they find at best but little time to go deeply into detail in any branch of their work, and, as a rule, their knowledge of the intricacies, scientific or practical, in the manufacture of such things as paints, springs, rolled iron and steel, malleable iron, car couplers, wheels, journal bearings, metal brake beams, and many other parts of locomotives and cars, must be superficial, and as railroad companies cannot often afford to pay the necessary salaries to obtain competent experts in these lines of manufacture it seems a reasonable conclusion that if a railroad wishes to get the best articles in these and many other lines which require expert knowledge they can best do so by obtaining them from companies who make a special study of the manufacture of such goods and who are able to employ the best expert talent to supervise their make up. In order to do this, knowing from experience that one class or make of article is superior to another, it is many times entirely justifiable to specify manufactured articles by name, to the exclusion of others.

"Let us, in railroad mechanical circles, acknowledge that life is not long enough for us 'to know it all' and therefore that in many lines we must defer to the specialist, who can devote his time to study of one line and obtain from such study the best possible results. The same principle applies to patented articles. There seems to be a special prejudice in the minds of some good railway officers against any article or device protected by patent. To be sure many patents are granted on devices that have little merit, but on the other hand, if a man by giving special thought and study in a certain direction has evolved ideas which are of manifest value, why should it be thought to be an act which outlaws the article devised, if in order to prevent his valuable idea from theft or piracy he should protect it by a patent? In these days of rapid development in invention, very few good ideas are evolved without being protected by patents, and unless a railroad company wishes to put up with clumsy or out of date methods and devices, it becomes necessary to patronize quite liberally articles which are patented.

"No one doubts the necessity, when a law is passed or a rule established, of taking reasonable means to see that the law is enforced or that the rule is obeyed. The failure to observe this necessity would utterly annihilate order and discipline and would put an end to good government. Equally urgent is the necessity for reasonable inspection of new construction, when drawings and specifications have been furnished. The writer has personally seen several instances of building of new equipment where drawings and specifications had been furnished, but where the railroad company had sent no competent inspectors to see that the requirements were lived up to. This necessity for inspection as the work progresses is not always on account of the possibility of the manufacturing company countenancing or encouraging a disregard of the specifications, but largely from the fact that workmen are often neglectful or are not properly instructed by their foremen, and sometimes even think they are working their company a benefit by avoiding compliance with some part of a specification which will make the construction more expensive. It is oftentimes cheaper and better for both the construction company and the railroad company if the latter has several of its brightest and best men stationed at the manufactory to inspect the work in detail, thereby insuring compliance with specifications, and an immediate discovery and correction of errors without waiting till a locomotive or car is completed and the defective part covered up, or for it to be put in such a position as to be very expensive to remove and correct.

STANDARDS EXISTENT AND PROPOSED FOR 60,000-LB. BOX CAR, JANUARY, 1897.

	Barney & Smith Car Co.	Locomotive Engineering Journal.	The Terre Haute Car & Mfg. Co.	The Elliott Car Co.	The Ohio Falls Car Mfg. Co.	United States Car Co.
Clear inside length.....	33 ft. 0¼ in.	36 ft.	33 ft. 6 in.	34 ft.	34 ft.	33 ft. 4¼ in.
" " width.....	8 ft. 3½ in.	8 ft.	8 ft. 4 in.	8 ft.	8 ft. 2¼ in.	8 ft. 1¼ in.
" " height.....	7 ft. 2 in.	7 ft.	6 ft. 9 in.	6 ft. 11 in.	6 ft. 8¼ in.	7 ft. 0¼ in.
Door opening.....	5 ft.	5 ft. 6 in.	5 ft.	6 ft.	5 ft. 6 in.	5 ft. 6 in.
Center to center of center ties.....	6 ft. 10 in.	8 ft. 10 in.	4 ft. 6 in.	6 ft. 9 in.	6 ft. 3 in.	8 ft.
Section of side sills.....	5 in. × 8½ in.	5 in. × 9 in.	5 in. × 9 in.	5 in. × 10 in.	5 in. × 9 in.	5 in. × 9 in.
" " center sills.....	5 in. × 8½ in.	5 in. × 9 in.	5 in. × 9 in.	5 in. × 10 in.	5 in. × 8½ in.	5 in. × 9 in.
" " intermediate sill.....	5 in. × 8½ in.	5 in. × 9 in.	4 in. × 9 in.	4 in. × 10 in.	5 in. × 8½ in.	5 in. × 9 in.
" " side plate.....	3½ in. × 7 in.	.....	4 in. × 6 in.	.....	3 in. × 6 in.	3 in. × 8 in.
" " end.....	3½ in. × 12 in.	.....	.....	.....	3½ in. × 12 in.	3 in. × 13 in.
Height of lining.....	3 ft. 6 in.	7 ft.	3 ft. 6 in.	4 ft.	4 ft.	2 ft. 6 in.
Truss rod diameter.....	1¼ in.	1½ in.	1¼ in.	1½ in.	1¼ in.	1¼ in.
" " end.....	1½ in.	1½ in.	1½ in.	1½ in.	1½ in.	1½ in.
Wheel spread.....	4 ft. 10 in.	5 ft.	5 ft.	5 ft. 6 in.	5 ft.	5 ft.
Upper arch bar.....	4 in. × 1¼ in.	1 in. × 4 in.	1¼ in. × 4 in.	1¼ in. × 4 in.	1¼ in. × 4 in.	1¼ in. × 4 in.
Lower ".....	4 in. × 1¼ in.	1 in. × 4 in.	1¼ in. × 4 in.	1¼ in. × 4 in.	1 in. × 4 in.	1 in. × 4 in.
Tie bar.....	4 in. × ½ in.	½ in. × 4 in.	½ in. × 4 in.	½ in. × 4 in.	½ in. × 4 in.	½ in. × 4 in.
Set of upper arch bar.....	.....	6 in.	.....	.....	5 in.	5 in.
" " lower ".....	.....	14 in.	.....	.....	12 in.	13 in.
" " tie bar.....	.....	.....	.....	.....	1 in.	2¼ in.
Diameter of column bolts.....	1½ in.	1¼ in.	1½ in.	1¼ in.	1¼ in.	1¼ in.
" " oil box.....	1½ in.	1½ in.	1½ in.	1 in.	1 in.	1½ in.

opinions that the movement should take a wider scope than was first intended and should embrace every important part left undecided by the M. C. B. Association at its next convention. It has been decided, therefore, to continue the effort until the decision of the convention is reached, and to add to the standards then adopted an agreement covering as many parts as the car builders will unite on. The table which follows shows standards or suggested standards that have been reported to date. The variations in many of the dimensions suggest those which were found in rail sections eight or ten years ago, as described in an article on the subject in our issue of the 15th.

The G. E. Electric Brake for Street Railroads.

In our issue of Nov. 1, 1895, we illustrated the G. E. controller and electric brake for street cars, but did not show separately the cast-iron disk, which is one of the main parts of the apparatus. It will be well, therefore,

through the gears, by the retarding effort of its magnetic field while generating the braking current. The power, therefore, required to perform this work is taken from the energy of the moving car. Not only is the car thus retarded, but the brakes arrest the motion of the wheels directly with a force under perfect control of the motorman.

Specifications and Inspection of New Rolling Stock.

At the December meeting of the Western Railway Club Mr. A. M. Waitt, the President, read a paper entitled "Suggestions on Specifications for Construction and Inspection of New Rolling Stock." He pointed out the great importance of thorough and detailed specifications, saying that the average plans and specifications furnished by all but a few of the larger companies, are very crude and incomplete, putting but little restriction on the judgment of the manufacturer as to material and methods. He then considered in very general terms

"The subject undertaken in this paper is an important one, and is worthy of careful consideration by railroad officers, and though the treatment has been somewhat generalized, it is the hope of the writer that it may be the means of directing more care to specifications and inspection for new equipment by railroad companies which have not fully appreciated its importance in the past."

A Good Run on the Chicago, Milwaukee & St. Paul.

In our issue of Dec. 4, 1896, was an account of certain fast runs made between Camden and Atlantic City by Baldwin compound locomotives on the Atlantic City Division of the Philadelphia & Reading, giving a description of the engine, the weight of train and a profile of the road. These performances are very fine, but they are not altogether exceptional; some locomotives on the Chicago, Milwaukee & St. Paul, of essentially the same type, have been making some fast runs with very heavy trains.

The engines making these runs are Vaucain four-cylinder compounds, by the Baldwin Locomotive Works,

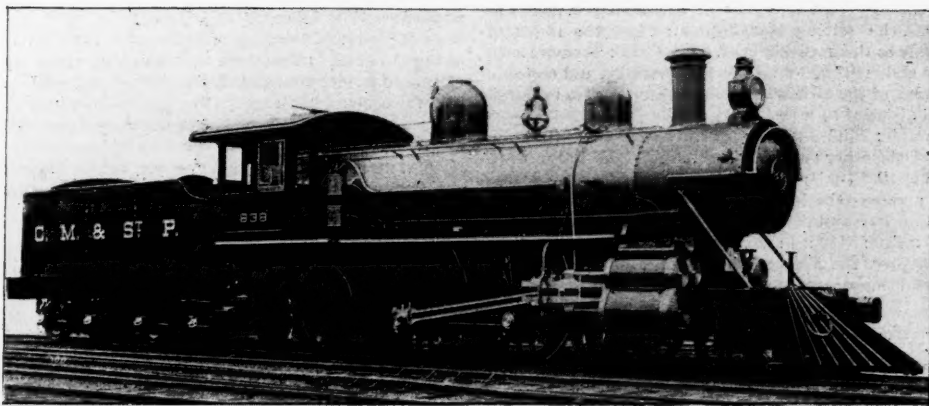


Fig. 1.—Compound Passenger Locomotive on the Milwaukee & St. Paul.

with 13 and 22-in. cylinders, 26-in. stroke. The driving wheels are 78 in. in diameter, and the total heating surface is 2,244.5 sq. ft. The total weight is 140,700 lbs., of which 71,600 lbs. is on the drivers. Further particulars regarding these locomotives can be found in the *Railroad Gazette* of July 24, 1896. On July 3 of last year, before it had been in service two weeks, engine No. 839, a mate to No. 838, given in our illustration, hauled a 13-car train from Chicago to Milwaukee, a distance of 84.9 miles, in 112 minutes. The loaded train weights were:

	Pounds.
Locomotive.....	140,700
Tender.....	85,000
Baggage car.....	70,600
Six coaches.....	405,140
Four drawing room cars.....	310,000
Two sleeping cars.....	188,650
Total weight.....	1,200,090

A profile of the road and details of the run are given in Fig. 2.

City limits require that the schedule shall not be exceeded, but the run from Forest Glen to National avenue, 74 miles, including four slow-ups and one stop at Western Union Junction, must be made in 84 minutes to schedule. On July 3, five minutes were lost at Western Union Junction in shifting the train, but when National avenue was reached the train was two minutes ahead of time, having run the 74 miles, including four slow-ups and one stop, in 82 minutes, or at an average speed of 54.2 miles an hour. The fastest mile was made in 45 seconds, which is at a rate of 80 miles an hour.

The Teaching of Railroad Mechanical Engineering.

In our issue of Jan. 8, page 20, appeared an abstract of a paper by Prof. H. Wade Hibbard, presented at a meeting of the Northwest Railway Club. At the January meeting of the club this paper was discussed and much approval of the ideas contained in it was expressed.

Mr. J. O. Pattee, S. M. P., Great Northern, thought that technical students should be taught to talk, to express themselves clearly, as an advantage in securing positions and promotions and in directing subordinates.

Mr. William McIntosh, M. M., C. & N. W., acknowledged the great advantages of a college education, but desired to emphasize the practical side of the profession.

Mr. T. A. Foque, Assistant Mechanical Superintendent Soo Line, desired to see practical chemical analysis taught in a technical school course. Where a graduate goes to a small road this ability to test material both physically and chemically is very valuable. He also believed that the languages should be completed before entering upon the university technical four years' course.

Mr. Geo. D. Brooke, M. M., St. P. & Duluth, desired to have us direct our graduates into an insight of the principals of management of men and told of the small-sized but vigorous strike he had upon his hands as a foreman soon after leaving Washington University, St. Louis.

Others made suggestions or asked questions.

Michigan Railroad Commissioner's Report.

An interesting chapter from the annual report of the Railroad Commissioner of Michigan showing the methods of taxing railroads in 47 states and territories was published in the *Railroad Gazette* of Jan. 15. We now note the main features of the rest of the report.

As usual the reports of the railroads are a year old before the Commissioner publishes them, and he recommends a change in the law, so that the statistics will be brought down to June 30, the Commissioner's report being made on Dec. 1.

The Commissioner recommends that electric railroads be brought under the supervision of his office, as also telegraph and telephone lines.

Earnings, expenses, capital, etc., are given for 22 street railroads, operating 322 miles, but there are a large number of such roads which have not reported. Street railroads report to the Secretary of State, not to the Railroad Commissioner, and there is no penalty for non-compliance with the law.

The taxes due from the railroads in Michigan in 1896

ing the introduction of this class of machinery, the practical knowledge and education gained by years of experience has rendered their value unimportant.

The Commissioner has ordered frogs at nine crossings of steam and electric roads, and derailling switches and signals at four of these crossings. A large number of telegraph and other wire lines crossing the tracks of the railroad companies have been inspected during the year. The engineer recommends that the number of wires allowable on one line of poles, as also the dimensions of poles, be fixed by law.

A train on the Flint & Pere Marquette Railroad having been derailed in April, 1895, by a worn flange under the forward end of an engine, the permissible thinness of flanges was referred to the Master Mechanics' Association, and that Association, on the recommendation of a committee which was appointed to investigate, adopted these conclusions:

1. That the minimum thickness of leading engine truck wheel flanges should be the same for both iron and steel wheels.
2. That the minimum thickness be 1 in., measured at a point $\frac{1}{4}$ in. from the top of flange.

A statistical table is given, following the report, which is said to be "confined exclusively to Michigan business and mileage." Of some of the items this is obviously true; others must, in the nature of the case, be based partially on estimates. We copy from the table as follows:

	1895.	1894.
Length of road, miles.....	7,610	7,512
Length of second track, miles.....	144	144
Capital stock paid in.....	\$137,073,202	.....
Paid in per mile of road.....	18,246	.....
Amount held in Michigan.....	10,885,374	\$11,358,388
Total debt.....	179,259,825	.....
Debt per mile of road.....	23,861	.....
Total stock and debt.....	316,333,027	.....
Stock and debt per mile of road.....	42,107	.....
Cost of roads and equipment.....	301,003,148	300,620,020
Cost per train mile of road.....	40,066	.....
Earnings.....	28,673,068	28,864,804
Earnings per mile of road.....	3,835	3,901
Total taxes.....	741,408	676,136
Taxes per mile of road.....	97	89
Taxes, per cent. of earnings.....	2.54	2.29
Train mileage:		
Passenger.....	10,878,300	.....
Freight.....	14,142,154	.....
Total number of employees.....	24,617	23,458
Total number of stations.....	1,534	1,514
Number of miles of fencing, completed.....	10,508	10,262
Crossings, number:		
Railroad.....	402	400
Highway at grade.....	7,699	7,690
Highway, over or under.....	211	213
Highway, with gates or signals.....	530	514
Number of new bridges.....	45	73
Aggregate length of new bridges, feet.....	3,375	6,000
Passengers killed.....	4	2
Passengers injured.....	13	17
Employees killed.....	32	37
Employees injured.....	215	169
Others killed.....	100	90
Others injured.....	72	78
Total killed.....	136	129
Total injured.....	309	281

Deep Waterways from the Lakes to the Sea.

It will be remembered that just about a year ago the President appointed a Commission to report on deep waterways from the great lakes to the ocean. This Commission consisted of President Angell, of the University of Michigan; Mr. J. E. Russell, of Massachusetts, and Mr. L. E. Cooley, of Chicago. These Commissioners acted in concert with Mr. O. A. Howland, of Toronto, Mr. T. C. Keefer, Past President Am. Soc. C. E., of Toronto, and Thomas Monroe, C. E., of Coteau Landing.

The report of the Commission was transmitted to Congress by President Cleveland on Monday of this week, and in his letter sending it he says that the Com-

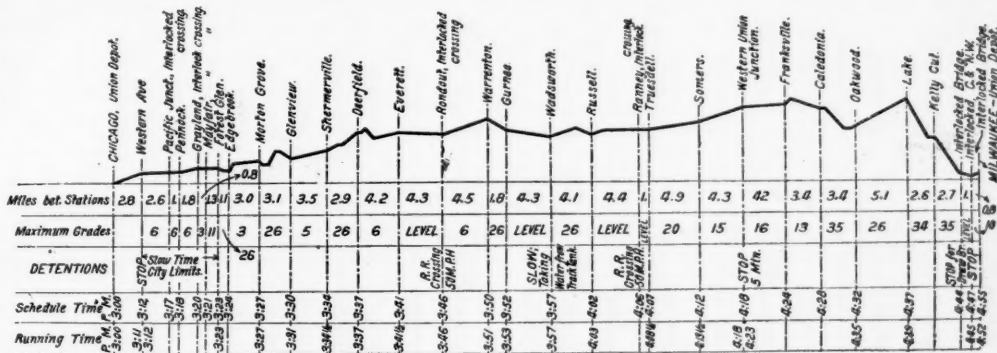


Fig. 2.—Profile of Road and Details of Run—C. M. & St. P.

one railroad with another 97, or over one-half, are protected by interlocking signals. The inspector found three interlocking machines which he held ought to be renewed. The speed of trains is not properly reduced at interlocked crossings. Mr. Moore reiterates his opinion expressed a year ago, that distant signals had better be nailed in a horizontal position, unless there is a track circuit from the distant to the home signal, by which the signalman will be prevented from changing the route after a train has passed the distant signal.

Six new interlocking plants have been constructed and approved during the year and many others enlarged, renewed or repaired. Owing to the general use of interlocking appliances and the competence of construction and supervision by the railroad companies, the monthly reports of daily inspection which had been required have been dispensed with. This was done at the beginning of 1896, and subsequent inspections have demonstrated that, while these reports were necessary dur-

missioners have demonstrated the feasibility of securing direct and unbroken water transportation from the lakes to the sea. He says further that the Commissioners have labored without compensation and suggests to Congress the propriety of providing for further prosecution of their work.

The Commissioners make no estimate of the cost of canals on either of the lines suggested by them. They say that canals, as suggested, are entirely feasible and recommend a depth of not less than 20 feet. From Lake Erie the water route would reach Lake Ontario by a ship canal from Tonawanda to Olcott. From Lake Ontario the Canadian seaboard may be reached by the St. Lawrence and the Atlantic seaboard by the St. Lawrence and Lake Champlain and the Hudson River, or by the Oswego, Oneida, Mohawk Valley and the Hudson River. These routes to the Hudson River require complete surveys.

A moderate control of the level of Lake Erie and of the

Niagara River above Tonawanda may be justified. The policy should contemplate the ultimate development of the largest useful capacity, and the work should be organized with that in view. It is practicable to develop the work in sections and the several sections by degrees, each step having its economic justification, so that benefits shall follow closely on expenditure without waiting the completion of the whole system. The Niagara ship canal should first be undertaken, and along with it the broadening and deepening of intermediate channels of the lakes.

Complete surveys and investigations with measurements of the outflow of the lakes will cost not less than \$600,000 and will require some years of time; but the measurement of the outflow of the lakes and the final levels can be done through some other agency, thus deducting \$250,000 from the \$600,000. The specific surveys, to cost \$350,000, would take two or three years, and not less than \$150,000 should be appropriated the first year and along with it an additional sum of \$100,000 for measuring the outflow of the lakes.

Intercepting Valve—Great Southern & Western Locomotive, Ireland.

The accompanying illustration shows two sections of an intercepting valve used on a compound locomotive which was designed by Mr. Ivatt for the Great Southern & Western Railway, in Ireland.

The locomotive was built under the Worsdell-von Borries and Lapage's patents, with an arrangement of change valve designed by Mr. Ivatt. This valve, of which we give a section, allows the locomotive to be worked simple or compound at will. It is actuated by a small lever and rod from the foot-plate, which, by suitable valves, admits steam to a cylinder on the spindle of the change valve, and so moves it to either position, the movement being controlled by a dashpot. When in the "simple" position the valve opens a communication from the high pressure exhaust to the blast-pipe, round the underside of the high-pressure cylinder; at the same time it closes the communication from the high-pressure exhaust to the low-pressure steam chest, and opens

aplicable to his practice. This article does not undertake to explain the theory nor manner of performing rudimentary calculations, as they are fully treated in the pamphlet that accompanies the rule, but gives at once the application to grades, curves, transition curves, etc.

The scales on the slide rule will be referred to in the description of the settings as follows: The upper scale on the rule as *A*, the upper scale on the slide as *B*, the lower scale on the slide as *C*, and the lower scale on the rule as *D*.

GRADES.

Railroad grades are expressed in three ways: As a percentage of the rise to the horizontal distance, as so

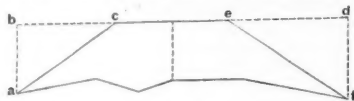


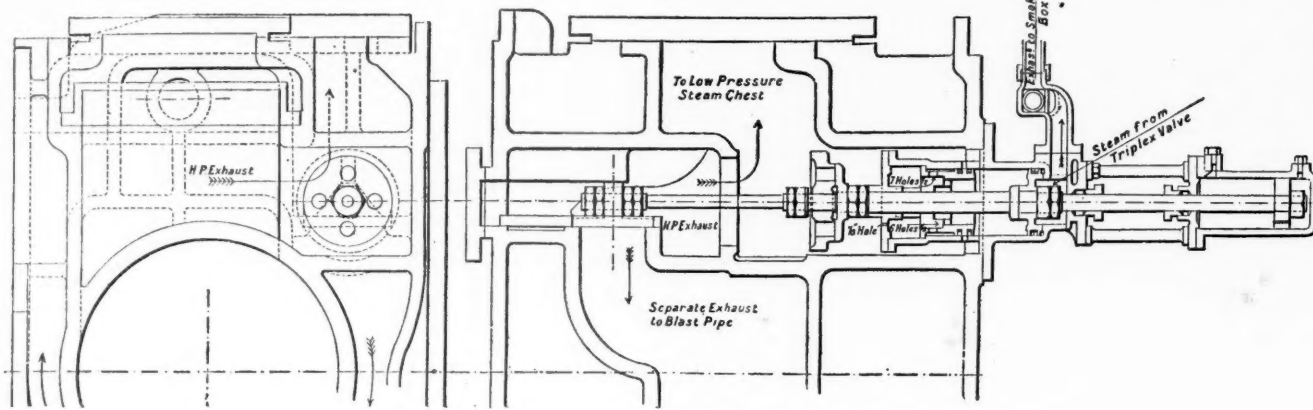
Fig. 2.

many feet per mile, and as the horizontal distance to a rise of 1.

To change from one way of expressing a grade to another, the setting is as follows: Place the index of the slide to the rate per cent. on the rule; opposite 5,280 on the slide will be found the feet per mile, and opposite the index of the rule will be found on the slide the horizontal distance to a rise of 1.

Example: Find the rate of an 0.8 per cent. grade expressed the other two ways. Set the right index of *C* over 8 on *D*. Under 5,280 will be found 42.2, the feet per mile; and over the left index of the rule will be found 125, the horizontal distance to a rise of 1—that is, $8 : 100 :: 42.2 : 5,280 :: 1 : 125$. With feet per mile given, set 5,280 over the rise; under the index of the slide will be found the percentage, and over the index of the rule will be found the horizontal distance to a rise of 1. With the horizontal distance to a rise of 1 given, set it over the index of the rule; under the index of the slide will be found the percentage, and the rise per mile will be found under 5,280.

To find the rise for a point between stations on a grade,



Ivatt's Intercepting Valve for Compound Locomotive—Great Southern & Western Railway, Ireland.

a connection for live steam from the steam pipe to the low-pressure steam chest. The supply of live steam is wiredrawn, so as not to exceed about 75 lbs. pressure on the low-pressure side, and the low-pressure cylinder and steam chest are, as usual, provided with relief valves, set to blow at 75 lbs. in case the pressure should exceed that amount.

In ordinary working the locomotive is always run compound, and starts without any trouble, but for starting on an incline, or for getting away quickly with a heavy train, the arrangement for working simple is of great advantage, and enables the engine to exert as much power as a simple engine with two 18-in. cylinders and the same steam pressure. The arrangement is exceedingly handy for shunting; there is no steam locked up in the receiver, and the engine does not, in steam-shed phraseology, "beat two or three times after steam is shut off."

The working of the change valve is entirely in the hands of the driver. Mr. Ivatt does not believe in the theory that it is not advisable to give the driver the power of working simple if required. To argue that the driver of a compound engine so fitted is likely to work the engine simple any longer than is absolutely necessary, is about the same as saying that the driver of an ordinary engine cannot be trusted to pull the reversing gear up as soon as possible.—*The Engineer*.

The Slide Rule as an Aid to Railroad Field Work.*

BY GEORGE DUNCAN SNYDER,
Associate Member American Society of Civil Engineers,
City Engineer, Williamsport, Pa.

The slide rule is an instrument that is too little known and appreciated by engineers. It is peculiarly adapted to the numerous calculations necessary on a railroad survey, and will pay for itself over and over again in the time it will save. The writer, in the following article, gives the settings he has found useful in his own work, feeling confident that any engineer who will start the use of the slide rule will find many other settings ap-

*Copyrighted 1897 by George Duncan Snyder.

set the index of the slide over the percentage, and the rise for any plus will be found on the rule under the plus on the slide. For instance, with a 1.17 per cent. grade, what is the rise for +27.7 and +82.3? Set the left index of *C* over 1.17 on *D*. Under 27.7 will be found .324; under 82.3 will be found .963. In the same way the rise for any number of stations can be obtained.

Example.—How much will a .56 per cent. grade rise in 45 stations? Set index of slide over .56; under 45 will be found 25.2. Having run 125 stations with a rise of 170, what will be the rate for a uniform grade? Set 125 over 170; under the index will be found 1.36 per cent.

The slide rule is also well adapted to the grades of streets.

Example.—A block is 250 ft. long with five 50-ft. lots on it. The street rises 4.16 ft. in this distance. At a uniform grade, what will be the rise at the corner of

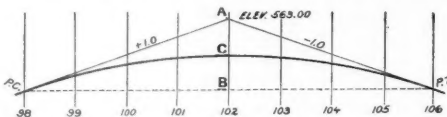


Fig. 4.

each lot? Set 5 on the slide over 4.16 on the rule; then under 1 will be found .83, the rise at the end of the first lot; under 2 will be found 1.66; under 3 will be 2.50; and under 4 will be 3.33, being the rise at each successive corner. If points are desired at other distances, set 250 over 4.16, and under any distance on the slide will be found the corresponding rise on the rule.

SLOPE STAKES.

In setting slope stakes for railroad grading, it makes a bothersome calculation to find the distance out to set a stake for a given height. With slopes of $1\frac{1}{2}:1$ set the left index of the slide over 1.5; under any height on the slide will be found the corresponding distance out on the rule, to which must be added one-half the width of roadbed to obtain the distance from the center line.

SLOPES FOR TOPOGRAPHY.

On preliminary lines, the angle from the horizontal of the slope of the ground is often taken, from which data contours are obtained for mapping. To find the distance that contours will be apart for any angle or slope, set the slide inverted, so that the scale of tangents is along scale *A*, with the indices coinciding. Then under any angle on the scale of tangents the horizontal distance to a rise of 10 ft. corresponding to that angle will be found on *D* (see Fig. 1). Thus opposite 7 deg. will be found 81.4; opposite 16 deg. will be found 34.9, etc. That is, with a slope of 7 deg., a 10-ft. contour will occur every 81.4 ft., with a slope of 16 deg. every 34.9 ft. Five-foot contours will be one-half the above, or for contours other than 10 ft. the index can be set over the vertical distance on *D*, and the horizontal distance can be read opposite the angles, as before. With the slide set as above, the position of the decimal point can be obtained by remembering that the left index of scale *D* represents 10, while the right index represents 100, so that for all slopes between 5 deg. 43 min. and 45 deg. the horizontal distance for a 10 ft. contour must be between 10 and 100, i.e., have two figures ahead of the decimal point. As an angle less than 5 deg. 43 min. cannot be read on the scale of tangents, the slide must be set with *C* inverted, so that 5 73 deg. is over the left index of *D*, when slopes expressed in degrees and decimals can be read on *C* over the horizontal distance the contours are apart on *D*. The results thus obtained will require three figures ahead of the decimal point. With the scale of tangents in its normal position, the vertical rise for 100 ft. horizontal will be found on *D*, opposite the angle on the scale of tangents.

AREAS OF CROSS-SECTIONS.

Areas of cross sections can be obtained on the slide rule, not with sufficient accuracy, when large, for final estimates, but close enough for many purposes.

Example 1.—What is the area of a level section of an embankment with a 16-ft. roadbed, slopes $1\frac{1}{2}:1$, center height 6.8 ft.? Here the distance out plus one-half the roadbed multiplied by the center height will give the area. The distance out is 18.2; plus 8 is 26.2. Set the

index to 26.2 on *D*; under 6.8 on *C* will be found 178.2, the area required.

Example 2.—With slopes and roadbed as before, what is the area of a section with a center height of 5.6, with one side height of 4.2, at a distance out of 14.3, the other side height being 6 at a distance out of 17.0? Set index on 31.3, the sum of the two distances out; under 2.8, one-half the center height, will be found 87.6. Set index on 8, one-half the roadbed; under 5.1, the average side height, will be found 40.8. $87.6 + 40.8 = 128.4$, the area required.

With irregular sections, the methods remain the same as usual, the multiplication being performed on the slide rule. It is generally necessary to subtract the areas of the triangles *abc* and *def*, Fig. 2. As these triangles are similar, their areas increase as the square of the base or altitude. With slopes $1\frac{1}{2}:1$, the area of a triangle with an altitude of 1, is equal to .75. Set 75 on *B* over the right index of *D* (see Fig. 3), then over altitudes on *D* will be found areas on *B*. Thus, the area of a triangle with an altitude of 2 is 3; with that of 4 is 12, with that of 18.6 is 259, etc. With slopes of 1:1, the area of a triangle with an altitude of 1 is .5, and 5 should be set over the right index of *D*. In the same way, by setting the area for an altitude of 1 for any rate of slope, the area for any altitude can be obtained.

QUANTITIES.

The work of obtaining the cubic contents of earth work does not differ on the slide rule from the work with figures, as shown in the following example, using the method of average end areas.

Example.—Two sections are 82 ft. apart, and have areas of 286 and 318 sq. ft. respectively. What are the cubic contents? The average of the two areas is 302. Set 27 on *A* over 302 on *B*; under the index will be found 1,118, the number of cubic yards if the sections were 100 ft apart, and under 82 will be found 917 sq. yds., the volume required.

VERTICAL CURVES.

Vertical curves can be very readily computed with the slide rule by considering them as parabolas, instead of

circular curves. The ordinates of such curves from their tangents will then vary as the square of the distance. Having decided on the length of the vertical curve to use, the elevation of each station is first obtained as though no curve were to be used, and to these elevations a correction is made for the curve. The nature of the parabola is such that the distance *AC*, Fig. 4, is one-half *AB*. To find *AB*, multiply one-quarter the length of the vertical curve expressed in stations of 100 ft. by the sum of the two rates of grade, if they incline in opposite directions, and by their difference if they incline in the same direction. Having found *AB* and *AC*, the intermediate offsets vary as the square of the distance from *P. C.* or *P. T.* When the angle between the grade lines is upward, the offsets are to be added; when it is downward, they are to be subtracted.

Example 1.—A grade of +1.00 intersects a grade of -1.00 at station 102 at an elevation of 553.00 (see Fig. 4). Obtain the elevations for a vertical curve 800 ft. long. The *P. C.* will be at station 98 and the *P. T.* at station 106, both having an elevation of 559.00. The distance *AB* will be 4.0, one-half of which is 2.0, the ordinate at the apex. There are four stations on each side of the apex. Set 4 on *C* under 2.0 on *A*; over the index will be found .125, the ordinate at station 99; over 2 on *C* will be found .50 on *A*, the ordinate at station 100; over 3 on *C* will be found 1.125, the ordinate at station 101. These same ordinates in reverse order can be used for the stations beyond the apex.

The elevations of this curve would be as follows:

Station.	Elevation.
98 <i>P. C.</i>	559.0 - 0.0 = 559.00
99.....	559.0 - 0.125 = 558.875
100.....	559.0 - 0.50 = 558.50
101.....	559.0 - 1.125 = 557.875
102.....	553.0 - 2.00 = 551.00
103.....	553.0 + 1.125 = 554.125
104.....	553.0 + 0.50 = 553.50
105.....	553.0 + 0.125 = 553.125
106 <i>P. T.</i>	559.0

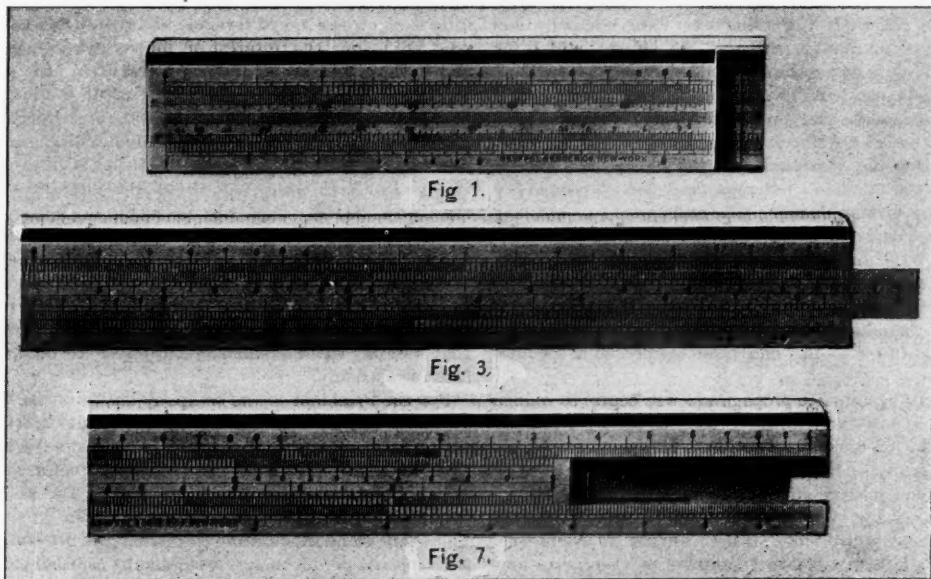


Fig. 1.

Fig. 3.

Fig. 7.

Slide-Rule Settings.

Example 2.—A grade of -0.4 intersects a grade of -1.3. Find the elevation of points every 50 ft. for a vertical curve 600 ft. long (see Fig. 5).

First find the elevation of points every 50 ft. on the straight grade line. Then as the two grades incline in the same direction the difference in the rates is taken, which is 0.8; this multiplied by one-quarter the length of curve, 1.50, gives 1.20, one-half of which is 0.60, the ordinate at the apex. As the points are to be 50 ft. apart there will be six on each side of the apex. Set 6 on *C* under 6 on *A*, and the intermediate offsets will be found on *A* over 1, 2, 3, 4 and 5 on *C*, as shown in the example as worked out.

Station.	Elevation.
99 <i>P. C.</i>	560.0 - 0.00 = 560.00
+50.....	559.8 - 0.02 = 559.78
100.....	559.6 - 0.07 = 559.53
+50.....	559.4 - 0.15 = 559.25
101.....	559.2 - 0.27 = 558.93
+50.....	559.0 - 0.42 = 558.58
102.....	558.8 - 0.60 = 558.20
+50.....	558.6 - 0.42 = 557.78
103.....	558.4 - 0.27 = 557.33
+50.....	558.2 - 0.15 = 557.05
104.....	558.0 - 0.07 = 557.93
+50.....	557.8 - 0.02 = 557.78
105.....	557.6 - 0.00 = 557.60

Example 3.—A grade of -1.4 intersects a grade of +1.6; curve to be 10 stations long (see Fig. 6). As the rates of inclination are in opposite directions the sum of the grades is taken, which is 3. Multiplying this by one-quarter the length of curve gives 7.50, one-half of which is 3.75, the ordinate at the apex. Setting 5 on *C* under 3.75 on *A*, the intermediate offsets will be found on *A* over 1, 2, 3, 4 and 5 on *C*, as shown in the example as worked out:

Station.	Elevation.
111 <i>P. C.</i>	429.60 + 0.04 = 429.60
112.....	428.20 + 0.15 = 428.35
113.....	426.80 + 0.60 = 427.40
114.....	425.40 + 1.35 = 426.75
115.....	424.00 + 2.40 = 426.40
116.....	422.60 + 3.75 = 426.35
117.....	421.20 + 2.40 = 423.60
118.....	420.00 + 1.35 = 421.35
119.....	418.80 + 0.60 = 419.40
120.....	417.60 + 0.15 = 417.75
121 <i>P. T.</i>	430.60 + 0.00 = 430.60

RAILROAD CURVES.

One of the slide rule's greatest uses to a railroad engineer is in the numerous calculations in connection with railroad curves. While most of the necessary information appertaining to railroad curves is tabulated in the different field-books, the field-book is not always at hand when needed, and the slide rule is so convenient that the engineer, having once become familiar with it, will always carry it with him, and by it do nearly all the work that will arise in curve running.

Radii.—The radii of curves are obtained as follows:

The formula is $R = \frac{50}{\sin \frac{1}{2} D^\circ}$, so by setting one-half the degree of curve on the scale of sines under 50 on scale *A*,

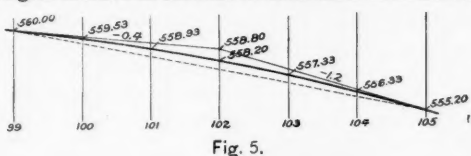


Fig. 5.

the radius will be found over the index. Thus for an 8 deg. curve, set 4 deg. under 50; over the index will be found 717. For a 2 deg. 40 min. set 1 deg. 20 min. under 50; over the index will be found 2,150.

A more convenient way of obtaining radii is to set the index of *C* inverted over 5,730, the radius of 1 deg. curve; then the radius will be found on *D*, under the degree of curve expressed decimally on *C* (see Fig. 7). For curves less than 5 deg. 44 min., set the right index over 5,730; for curves between 5 deg. 44 min. and 10 deg., use the left index.

Lengths of Curves.—With the degree of curve and the total angle given, to obtain the length is merely a prob-

50 min. is 4 deg. 25 min. = 4.417 deg. Set index of *C* on 1,745 on *D*, move runner to 4.417, then set index to runner; under 2,865 will be found 221.3, the apex distance required.

When one-half the total angle is greater than 45 deg., divide the radius by the complement of one-half the total angle.

Example.—What is the apex distance of a 10 deg. curve with a total angle of 96 deg. 30 min.? One-half of 96 deg. 30 min. is 48 deg. 15 min. The complement of 48 deg. 15 min. is 41 deg. 45 min. Set 41 deg. 45 min. on the scale of tangents over 573; under index will be found 642, the distance required.

(TO BE CONTINUED.)

Kansas Railroad Commissioners' Report.

The Railroad Commissioners of Kansas, Joseph G. Lowe, J. M. Simpson and Samuel T. Howe, have issued the 14th annual report of the Board. Thirty-one complaints have been formally dealt with during the year and 26 were disposed of informally. The Commissioners discuss the general question of railroad rate problems and state regulation, pointing out the complexity and difficulty of the questions involved. They seem to regard additional legislation as necessary, but they do not give definite recommendations as to what it should be. They remind their constituents that 90 per cent. of the business done by the railroads in that state is interstate, so that they must look to Congress for help from legislation. It is pointed out, however, that maximum rate laws and all hard and fast laws of that kind are likely to be detrimental to the public welfare, and further, that a commission, to deal wisely with the railroad problem must have a better tenure of office than is now customary. The Commissioners advocate rotation in terms of office, and the removal of members for cause only, aiming thereby to insure the constant presence in the Commission of one or more members having some experience.

The Commissioners hope that the Kansas congressmen will aid in securing "all necessary national legislation" on uniform classification of freight, but they do not say anything definite in favor of that so-called reform.

The Commissioners state that five railroads in Kansas have been abandoned, and they discuss the rights of the companies thus violating their charters, but they leave it to the Governor to decide what to do about it.

In October, 1895, the Commissioners ordered the railroads to change their live stock tariffs, making the rates by the hundred pounds instead of by the carload. The railroads did this, but the shippers complained that the cost was increased, and the Commissioners therefore ordered the former rates restored; but they call this a temporary order, and they expect to take the subject up again.

The Commission investigated the rates on corn to the East and to the Gulf of Mexico, numerous complaints having been made. The question was also referred to the Interstate Commerce Commission; but that body has not yet rendered a decision. Meanwhile, the railroads have made voluntary reductions, and the Commissioners may decide that no further action is needed. The average reduction from Kansas points to Chicago has been about 10 per cent. over the Rock Island road; and over the Atchison 13 per cent. on wheat and 14 per cent. on corn. To Galveston the Rock Island has reduced wheat 10 per cent. and corn 20 per cent.; the Atchison, wheat 4 per cent. and corn 6 per cent.

The length of railroad in Kansas is 5,062 miles. We find no intelligent summary of the financial statistics which would be of any value outside the state. The casualties to persons on the railroads of the state during the year were as follows:

	Killed.	Injured.
Passengers.....	3	63
Employees.....	29	278
Others.....	68	78
Total.....	100	424

Among the operating statistics we find a table showing that the number of ties laid in the tracks in Kansas during the year ending June 30 last was 2,001,494 oak, 464,218 cedar, 179,240 treated and 18,019 other. Of the treated ties 48,715 were laid by the Atchison and 130,525 by the Rock Island. The report does not state what kind of timber they were made from. The average price of all ties at the distributing point was, on the Atchison, 39 cents, and on the Rock Island 41 cents. On the latter road the treated ties were about 37 per cent. of the total number, while on the Atchison they were only 5 per cent. On the Burlington, using no treated ties, the average cost was 43 1/4 cents.

An Experiment in Ballast.

The Cleveland, Cincinnati, Chicago & St. Louis Railway is making a chemical analysis of a material called "chatts," with a view to using it for ballast. This material is a product of the lead mines in Missouri, left after the ore has been crushed, and the lead separated by gravity from the total bulk of the material. It is used for ballast in the vicinity of the mines, where it is well liked, and it has been offered for ballast to the "Big Four" Company. If analysis shows that there are in it no ingredients which would be detrimental either to the ties or the rails, about 20 miles of it will be put in this year for trial.

* The writer has followed A. M. Wellington's practice, and calculated the radii for curves between 8 deg. and 16 deg. on the basis of a 50 ft. chord.



ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

We have recently had an opportunity to examine a batch of newspaper clippings giving accounts of accidents due to the falling of electric wires. These clippings cover the months from May to September, inclusive, but it is not to be supposed that we have found in them reports of all or nearly all the accidents of that character which have taken place. We have found enough, however, to show that the matter is a very serious one. We find in the five months reports of 122 accidents due to falling trolley wires. In 11 of these accidents 12 persons were killed, and in 28 of them 31 persons were injured, and in 18 of them 24 horses were killed. During the same five months, we find reports of 40 accidents from falling electric light and telephone wires, showing that nine persons were killed in nine accidents, 27 were injured in 22 accidents, and seven horses were killed. The nature of the accidents is very familiar; that is, a broken live wire falls into the street, and a passer-by steps on it or picks it up and gets a shock which is often fatal. We thus find, during this period, a total of 21 fatalities resulting from falling live wires of all kinds. At this rate of mortality, if it were kept up, 50 persons would be killed in the year. In 1895 there were 33 passengers killed in train accidents on all the steam railroads of the United States, so far as we have been able to ascertain. It appears, therefore, that more persons are killed by live wire accidents than are passengers in railroad train accidents, and the difference might be still greater if complete statistics of the former were obtained. There have been widespread and persistent efforts made by the public in various ways for many years to minimize train accidents, by legislation and by agitation in the press, and by investigations and recommendations on the part of railroad commissions, but the serious mortality due to live-wire accidents does not appear to have attracted much attention from the public. There are simple and obvious means, which we suppose are not very expensive, for preventing accidents of this class; but until the public realizes the seriousness of the situation and the practicability of remedying it, probably little will be done. We suggest this subject as an interesting one for the daily newspapers.

The Nicaragua Canal.

There have been signs of a strong effort to push the Nicaragua Canal bill through this session of Congress, and now we learn that it has been advanced to the head of the Senate calendar. The bill provides that the United States shall guarantee the principal and interest of the bonds of the Canal Company to the amount of \$100,000,000; that all the expenditures of the company for construction, administration and promotion shall be reimbursed by delivery to it of guaranteed bonds; and that the company shall have \$7,000,000 of the new stock as a bonus. It is claimed that \$4,500,000 has been spent. So the company stands to make about 155 per cent. on the money that it has ventured in the enterprise.

Those who hope that the nation can be saved the

costly and dangerous experiment involved in the provisions of this bill must be vigilant and resolute, or their hope will be thwarted. Unfortunately, this is one of the cases where the advantages are with the offense. The bill is pushed by those who have a strong personal interest in its progress. To some of them it means money, and in some cases great sums of money; to others it means political advantage, or they think it does. It will do good to their sections, or they think it will; it is "aggressive" and "American" and popular, or they think it is. Those who oppose the bill have only the public interest in mind; they can gain nothing personally by opposition. We have seen signs of a very small railroad interest in the opposition, but this is narrowly confined. In fact railroad owners and managers must look at this project as other citizens do. If it is a good thing for the nation it is a good thing for them; if it is a bad thing for the nation, it is a bad thing for them. This is true even of the trans-continental railroads. The trans-continental business (not very profitable at best, and often unprofitable) which they would lose, is small in comparison with the stimulus to local business which would come from such results as the friends of the canal predict from its building. So it comes about that in the struggle to sell out to the nation the investment which has been made in the canal enterprise, the interest of those who favor the bill is all positive and the interest of those who oppose it is all negative, which puts the opposition into a disadvantageous place, and there has always been considerable danger that the bill would go through by default.

It may be well to sum up briefly the situation. It has long been evident that the canal enterprise could not be financed in the markets. The company has neglected no money center in its efforts, which for years have been assiduous. Indeed, we have excellent reason for believing that an effort was made to sell the concession and property to the Panama Canal Company. Last March we published a definite statement that the Nicaragua Company had tried to sell out to the Panama Company, and this statement we have never seen denied. The enterprise was entirely too speculative to attract capital. No one knows what it will cost, and estimates of its annual gross earnings vary all the way from \$500,000 to \$17,000,000. Naturally, money could not be obtained for the canal as a legitimate business enterprise. All that has been ventured in it so far has been simply as a speculation.

Then a systematic propaganda was begun to induce the people of the United States to back the scheme with the credit of the nation. This propaganda has been carried on with great skill and energy. The President of the company testified last spring, before a Congressional committee, that he had "traveled over the country three times, almost 50,000 miles," making speeches before Chambers of Commerce and other bodies, and he might have added political conventions. Other active agencies helped him, and, indeed, had been at work long before his activity began. It was not difficult to enlist public sympathy in the project; it appealed to the national ambition, and, like the Panama Canal, it appealed to the national vanity. The enterprise was so grand in its possibilities for all humanity, and especially for the United States, that it inflamed the imagination; and thus it came about that the statements of the advocates of the canal were accepted almost without question.

But four years ago, when it was quite possible that Congress would vote for a government guarantee, critical inquiry began to be made into the state of knowledge of the physical facts affecting cost of construction, with the result that the effort to get a guarantee then failed, and instead a bill was passed providing for an expert examination by disinterested engineers, on the ground. A board was appointed and proceeded to the isthmus. It was made up of an officer of the Corps of Engineers, United States Army, a civil engineer of the Navy and a civil engineer in civil life. These gentlemen are all men of position and distinction, and nobody questions their disinterestedness or their ability. They exhausted the information in the archives of the Canal company, and they got all the information on the ground that the money appropriated would gain. Then they reported that the canal would probably cost \$133,472,893; but they reported further that the data gathered were not enough for a safe judgment as to the practicability of the works proposed or as to the cost, and they recommended that the sum of \$350,000 be appropriated for further examination and that such an examination be extended over 18 months in order to include two dry seasons and thus get a reliable estimate of the rainfall and of the regimen of the streams concerned.

The report was made Oct. 31, 1895, and transmitted to Congress Feb. 7, 1896. Had it been acted

on at once half the work would now have been finished, and by next fall Congress would be in possession of the data necessary for an intelligent judgment as to the cost and engineering practicability of the project. But the officers of the Canal Company were determined that the recommendation of the Commission should not be adopted. They tried to break down the report, but the long hearing last spring before the House Committee only made the position of the engineer board stronger.

The President of the Canal Company said that the recommendation was intended only to delay this great enterprise. Anyone who will take the trouble to read the report and the testimony at the hearing can see for himself that the engineer board tried to ascertain and make public the facts; that they entered into the examination, as far as one can judge, with candid and unprejudiced minds, and all that they have said bears the mark of temperate judgment. On the other hand, the records show that the officers of the company endeavored to nullify the effect of the report and to get the bill forwarded without further investigation. On one side has been the wish that Congress and the people should be enlightened; on the other, that they should be kept in darkness. The result of the struggle is that the President of the Canal Company has himself been the greatest obstacle to despatch in hurrying the enterprise to a conclusion. By insisting that action should be taken without further inquiry he has postponed reasonable inquiry and has put off the final action of Congress.

But why should this great enterprise be hurried? The world is not suffering for it; the nation is not suffering for it. Two or three years' delay in beginning it can make no difference to anyone but those who are losing the interest of money already spent and to those who are in a hurry to realize on the sale of their securities with the government guarantee behind them. The old alarm that we must hurry or some foreign government or capitalist will snap the canal up, no longer has any effect. It has been shown that no foreigner wants it without the guarantee of the United States. Then why not make the appropriation recommended by the engineer board and make the further investigation into this complicated and enormous engineering project? If the enterprise is so sound the holders of the concession need not fear the result and they will be able to sell out at a profit that will pay them a handsome interest to compensate for all delay.

But the President of the company has said that the action of our government has worked great injury to the Canal Company in that it has prevented subscriptions to their securities. In testifying before the House Committee last March, he said: "The people said that if they put their money into it the government will come in and take the Canal and we simply get a return of our money without any especial profit being allowed for the risk which we may take. . . . Foreign bankers have said we cannot take this up now because by the time we have raised and expended several millions on it the government of the United States will step in and take it away from us, and we shall get nothing but our cash in return. In other words, our profits will never be realized, and therefore we will not touch it until the government of the United States has decided what it will do." As we understand these statements they are that investors were deterred from a speculation, for fear that the action of the United States government might make that speculation an absolutely safe investment with the guarantee of reasonable interest and with the probability of a handsome bonus. We have often heard of the timidity of capital, but surely capital was never before so shrinking as when Mr. Miller confronted it with a threat of a government guarantee.

Railroad Earnings in 1896.

The gross earnings of the railroads of this country for 1896 are given by *The Financial Chronicle*, as 924 million dollars. The increase, as compared with 1895, is over 3 millions or one-third of one per cent. *Dun's Review* and *Bradstreets* also publish summaries of the yearly earnings, the former journal reporting earnings of 966½ millions for an operated mileage of 158,985, and the latter journal earnings of 797.7 millions in the year for roads operating 137,000 miles. *Dun's* figures out a decrease in 1896 of .2 per cent. over the earnings in 1895, and *Bradstreets* shows an increase of .7 per cent. The three journals arrive at the result that the railroad earnings of 1896 were not very different from those of 1895. The discrepancies between the totals are not inconsiderable, but we shall not undertake to account for them. *Dun's Review* does not publish the earnings of the individual roads, as do the others, but its tabulated comparisons are especially well compiled. We shall use the figures of the *Chronicle*, which has been gathering these fig-

ures for many years, although we believe that the *Railroad Gazette* was the first to publish these elaborate summaries. The *Chronicle* includes in its figures 132 roads operating 99,101 miles reporting for the 12 months and 73 roads with a mileage of 54,900 reporting for the 11 months also.

The monthly returns of gross earnings were marked by steady increases over the corresponding months of 1895 until August. This was in continuation of the improved reports which had begun in July, 1895, and kept growing better each month in the last half of that year, until, in January and February of 1896, the highest percentage of gain was reached, as compared with the previous year, in increases of 11 and 13 1/2 per cent. respectively. Those months, indeed, showed the largest earnings, with but one exception, which had been reported for four years. Every month since then, without exception, has shown a loss, highest in November (9.97 per cent.), falling off to 1.41 per cent. in December. Returns of January weekly earnings, so far published, are irregular, but we learn of a marked improvement in traffic on a number of roads in the East since January opened. It must be admitted that the expectation that business would largely increase immediately after the election has not been fully met, yet the improvement over the stagnation of the previous months has been real, probably more considerable than appears on the surface or by trade statistics.

The movement of earnings from month to month is shown in the following table, based on one from the *Chronicle*, to which we have added percentage comparisons of the falling off from 1892, the last year of ordinary business conditions with which comparisons can be made.

	1896.	1895.	Ino. or Dec. (per cent.)
January.....	37,686,489	33,951,041	10.9 5.1
February.....	35,257,181	31,068,010	13.5 9.7
March.....	37,250,670	35,674,299	4.4 16.4
April.....	37,240,276	36,014,491	3.4 11.5
May.....	37,524,386	36,689,752	2.2 3.9
June.....	37,762,780	35,357,817	6.8 11.6
July.....	41,617,094	40,007,082	4 8.5
August.....	40,561,759	41,444,183	2.6 9.3
September.....	43,296,333	43,450,854	4 13.9
October.....	49,832,102	52,116,295	4.3 3.6
November.....	41,099,043	45,652,215	9.9 1.9
December.....	42,893,334	43,507,220	1.4 8.9

Railroad revenue is a long way from the figures which were reached in 1892. The totals of gross earnings which we have for that year is 961 millions, but it is on a mileage of 14,000 less than that on which the 1896 figures are based. The 154,000 miles of road reporting in 1896 earned just about \$6,000 a mile. On the mileage given above for 1892, the earnings were about \$6,890 a mile. Taking, then, the mileage from which reports of earnings have been received in 1896, and assuming that if we had returns from as large a mileage in 1892, the earnings per mile given above would be maintained, we get a total of \$1,061.4 millions as the earnings of 1892. This makes possible a rough comparison between like things, and probably represents fairly enough the relative difference in the earnings of the railroads in the two years.

The figure agrees very well, as it happens, with a total given by *Dun's Review* for 1892, which is \$1,061.8 millions. The earnings, per mile, in 1896, figures out \$6,000 a mile, which shows a loss of \$900 a mile in 1896. That comparison gives a figure which is more easily remembered than the comparisons of totals. Of course it indicates the falling off in revenue in a very rough way. But if we take the gross earnings per mile for six years, as reported by the Interstate Commerce Commission we have these figures:

1895.	1894.	1893.	1892.	1891.	1890.
\$6,050	\$6,109	\$7,191	\$7,213	\$1,893	\$1,725

These figures are for the year to June 30. As, taking the country as a whole, the heaviest traffic is in the fall, the totals would show an appreciable difference, if given for the year to Dec. 31. For instance, earnings in the last half of 1895, as stated in the first part of this article, were quite good, and unfavorable reports did not begin until July. Therefore, the year to June 30, 1896, will show much higher earnings than the calendar year. For much the same reasons, the earnings per mile, for 1893, given above, do not indicate the depression of that year, because only a month or two of the hard times is included.

The earnings last year were increased by a heavy grain movement, just as in 1892 they were helped by a similar cause. In each year there were unprecedented crops in certain grains. The following table compiled from the *Chronicle* is of interest:

SEABOARD GRAIN RECEIPTS FOR FIVE YEARS.*			
	1896.	1895.	1892.
Flour, bbls.....	12,809,669	17,915,415	19,847,357
Wheat, bush.....	67,992,368	50,631,774	123,715,523
Corn, ".....	99,007,109	69,798,628	87,754,921
Oats, ".....	75,581,443	43,749,570	56,134,892
Barley, ".....	13,137,109	4,862,688	5,771,077
Rye, ".....	6,141,044	579,290	3,953,707
Total grain.....	260,462,373	159,621,930	277,330,120

* The figures are for 52 weeks of each year, not for the exact calendar year.

The totals of the seaboard receipts for 1892 and 1896 are not wide apart, and taken in connection with the large difference in earnings could be studied with interest. There were rate disturbances in 1892, from which, for the most part, we were free in 1896, but still the rates in 1896, on this traffic, probably averaged less than in the earlier year. Last year grain took the place of better paying freight which did not offer. In 1892, it was in addition to a heavy general movement of miscellaneous freight. Comparisons with 1895 show considerable improvement. The receipts of grain at the Western markets are as favorable as seaboard shipments. These were as below:

	1896.	1895.	1892.
Flour (bbls.).....	12,133,835	11,113,032	14,632,289
Wheat (bushels).....	185,519,041	174,536,260	215,100,519
Corn ".....	147,848,077	96,398,339	130,898,943
Oats ".....	169,881,187	124,324,823	115,451,686
Barley ".....	40,774,334	31,636,599	32,187,658
Rye ".....	6,739,015	3,813,378	7,178,134
Total.....	550,766,654	429,477,590	530,719,990

The grain movement is thus shown to have been 121 million bushels more last year than in 1895, a figure which shows in a striking way how important have been the large crops which we were fortunate enough to move this year. The railroads did not move so much flour or nearly so much wheat as in 1892, but the gain in corn and in the lesser grains was enough to show an increase of 3.77 on the total receipts at the great Western markets.

The gross earnings for the last two years and for 1892, by groups of roads, are shown in the following table:

	1896.	1895.	1892.
Trunk lines.....	\$131,789,640	\$133,633,619	\$141,393,000
Middle and Middle Western.....	65,158,085	65,704,366	67,788,000
Southern.....	72,994,876	70,146,677	73,689,000
Southwestern.....	62,238,871	62,146,439	69,460,000
Northwestern.....	82,656,946	79,706,743	87,807,000
Pacific.....	41,797,434	40,421,102	48,085,000

The greatest losses were borne by the trunk lines, and next to this the roads of the manufacturing states. All the other groups of roads show increases varying from half a million on the Southwestern lines to three millions on the Northwestern lines. Relatively to total earnings the showing of the Southern lines with an increase of 2.8 millions as compared with 1895 and a loss of but half a million dollars as compared with 1892 is much the best showing made. All the other groups of roads, as may be noticed, had larger earnings in 1896 than in 1895 and all had less earnings than in 1892, the decrease as compared with the earlier year varying from the half million reported on the Southern lines to 7.2 millions reported by the Southwestern lines, and the loss of 13 millions by the trunk lines.

In considering the traffic movement which affected the various groups we readily find an explanation for the heavy falling off in trunk line earnings and in those of the Middle States by the decreased output of factories and the falling off in coal, ore and iron. The good returns of the Southern lines are explained by the large cotton crop of the present year. The receipts of cotton at Southern outports amounted to 6,475,000 bales, an increase of 834,000 bales. The heavy movement has been since July 31, for up to that period the receipts had been 698,000 bales less than in 1895. The Northwestern lines profited by an exceptionally large spring-wheat crop. Early in the year the monthly increases in gross earnings reported by these lines were phenomenal. In the latter portion of the year these figures were, in many cases, replaced by large losses, but it will be seen that, taking the year as a whole, there was an increase of \$2,000,000 over 1895 by this group. The Southwestern lines make a poor showing, the Missouri, Kansas & Texas being the only line in this group which substantially increased its earnings.

Coming to the changes on individual roads for the year we find some large increases and large decreases. The Pennsylvania leads the latter list with a loss of almost \$5,000,000 in 11 months; the Philadelphia & Reading shows a loss of \$1,900,000 and the Southern Pacific a loss of \$1,747,000 in the same time. Twenty-two roads reporting for the 12 months and 14 others reporting for the five months had increases in excess of \$200,000, the total increases for all these companies amounting to over \$18,000,000. Eleven companies, including those named above, had decreases in excess of \$200,000, their total loss being practically 9 1/2 million dollars; the Big Four lost \$968,000, the Lake Shore \$840,000, and the Wabash \$687,000, and these were the only companies, other than those mentioned, losing more than \$500,000. The companies having the largest increases were the Canadian Pacific (\$173,700); Great Northern (\$1,505,000); Norfolk & Western (\$1,402,000); the Lehigh Valley (\$950,000), partly due to an increase of mileage; the Chicago & Northwestern (\$842,000); the Atchafalaya, Topeka & Santa Fe (\$829,000), and the Chicago, Milwaukee & St. Paul (\$744,000).

Standard Dimensions for Interchange Box Cars.

It is very likely that there was never more interest in the matter of establishing standard dimensions of freight cars than is felt now, or more activity in promoting standards, or a better chance of accomplishing something. In the last year or two, there has been a great deal of discussion of the matter in the traffic associations and in the railroad clubs, and at this time several of the most important of those associations, as well as some of the car-building firms, are making efforts in this direction. One of the influences at work to bring about standard dimensions, and perhaps the influence that is destined to be the most effective, is the work of the Master Car Builders' Committee on steel underframes. When that work was taken up, it was, at once apparent that an agreement must be reached as to general dimensions, and Mr. R. P. C. Sanderson was requested to make a canvass of the railroad companies and ascertain what general dimensions they would recommend. The result of his canvass is given in what follows. It is shown in the diagram published herewith, a little comment upon which is appropriate. The replies which are collected, come from a representation of over 840,000 freight cars out of a total of something like 1,200,000, the percentage represented being large enough to give the data collected a good deal of practical value. In the diagram, the vote, which is shown by the line of figures across the top, is given by thousands, that is, three ciphers are omitted.

Inside Length A.—Concerning the inside length it will be noted that there was a vote of 418,000 cars in favor of an inside length of 34 ft. even, while the minimum length recommended was 33 ft. and the maximum 39 ft. 6 in. Considering the great preponderance of the vote in favor of 34 ft. inside length of car, it is believed that the committee would be wise to adhere to this length for the 30-ton cars.

Inside Width B.—The recommendations vary from 7 ft. 6 in. to 8 ft. 9 in., the narrower cars being voted for from some of the Eastern and some of the Southern roads. The average width voted for would be very nearly 8 ft. 3 in., and the only objections to a wide car which can be presented would be that it requires greater strength of bolster, and may in some instances interfere with the clearances of narrow tunnels and bridges. But as there are a considerable number of cars running 8 ft. 6 in. and 8 ft. 9 in., inside width, and also at the same time having very considerable height, and as these cars seem to pass over a great majority of the railroads and into a great majority of the warehouses and tunnels without difficulty, it is believed that the inside width of even 8 ft. 6 in. could be used without any difficulty from clearances, and modern forms of steel construction have overcome the question of weak body bolsters.

Height from Top of Floor to Top of Plate C.—The average height recommended is within a small fraction of 7 ft. 4 in. This question of height is of greater importance with regard to clearances and with regard to safety of operation than is the width. The experience of crooked railroads having sharp curvature and imperfect alignment has shown that many derailments and wrecks have been due to the top-heavy condition of some of the modern freight cars. With a 6 or 7-in. elevation at low speed (when the centrifugal force has little or no effect), the center of gravity of a high car having a top-heavy load (such as coke, or where ice boxes are close to the roof) comes, especially with swing-motion trucks, or with trucks having large lateral or lost motion, close over the inside rail, relieving the outer wheels, which are the guiding wheels, of a great portion of their load. It is, therefore, of great importance to safe operation of railroads having sharp curvature that the height of the cars should be kept down, and that the use of cars having an inside height of 7 ft. 10 in., or 8 ft. should be discouraged.

Volume = A x B x C.—It will be seen by reference to the diagram that the cubic contents of the cars as recommended vary widely, all for the same capacity of 30 tons, the range being from 1,705 cu. ft. to 3,220 cu. ft. The only very strong vote is that for the cubic capacity of 2,124 ft. This question of volume is of the utmost importance as upon it depends largely the usefulness of any car. If the chosen length of 34 ft. be multiplied by the average width of 8 ft. 3 in. and by the average height of 7 ft. 4 in. a cubic capacity of 2,056 cu. ft. is obtained. At the same time (disregarding abnormally large and small cars) the average cubic capacity recommended is about 2,100 cu. ft. representing 70 cu. ft. per ton of 2,000 lbs. which is a very convenient and suitable figure. To obtain this with the length of 34 ft. inside and height of 7 ft. 4 in. would require a small fraction over 8 ft. 4 in. inside and it is therefore believed that for a 30 ton box-car, the best and most suitable dimensions, taking all things into consideration, would be 34 ft. inside length, 8 ft. 5 in. inside width, 7 ft. 4 in. height from top of floor to top of plate, which gives almost exactly the cubic capacity of 70 cu. ft. per ton of 2,000 lbs.

Width of Side Doors.—The recommendations for the most suitable width of side doors vary all the way from 4 ft. 9 in. to 6 ft. A curious feature of this question was that some of the roads recommending small cars, recommended doors 6 ft. wide, others recommending large cars recommended side doors only 5 ft. wide. It is believed that a width of 5 ft. 4 in. will be most suitable considering all things. The vote above this figure, representing 268,000 cars, and the vote below this figure (excluding the vote for doors under 5 ft.) was 292,000 cars. This width of 5 ft. 4 in., which it is believed would be

best to consider as standard, is wide enough for all ordinary purposes in loading furniture, etc., and is still narrow enough for the doors to be made sufficiently strong to stand internal pressure without excessive weight, and it must be remembered that the shrinkage and consequent misfit of the doors is augmented by the increased size.

End Doors.—The opinions as to the desirability of having or not having end doors were very evenly divided. Twenty of the important railroads voted for end doors and twenty against them. The sizes recommended did not vary much, and it is believed that a door 2 ft. wide by 3 ft. high in the opening, if end doors are used at all, will be of an entirely suitable size.

Height from Top of Rail to Top of Floor.—The recommendations for this dimension vary from 3 ft. 5½ in. to 4 ft. 5½ in. In transferring loads from car to car and from warehouse platforms the height of the car floor may vary 2 in. or 3 in. without causing any inconvenience as the gangway may be inclined to suit it. It is, however, of importance to keep the total height of the car and the center of gravity as low as possible. It is also of importance, especially in steel construction, to so arrange the center sills that the draft gear can be placed between them at the standard height prescribed by the law. It will be found that this can be conveniently done at about the average height recommended, which is 4 ft.

Height from Top of Rail to the Top of the Upper Center Plate.—This dimension was asked for with a view to ascertaining the height which would be most suitable for the greatest number of trucks, believing that it

ing stated that they absolutely objected to the introduction of cars of greater capacity than 30 tons for general interchange business.

Recent discussions at the railroad clubs and other railroad associations concerning the large-car question have prominently brought out the necessity of having the same volume per ton of capacity in interchange freight cars of different sizes, then large and small cars would be equally desirable from a shipper's standpoint, and thus the favoring of shippers by certain railroads with special cars of large cubic capacity on minimum freight rates would be avoided. If it is agreed that 70 cu. ft. per ton of 2,000 lbs. capacity is a proper figure to take for interchange box cars, it would be desirable that the 35-ton car should have the same height for reasons of safety for interchangeability of trucks, etc., and on account of the standard height of braw-bars, as the 30-ton ton. It would greatly simplify the designs and repairs of cars if the side posts, doors and widths for end sills, bolsters, etc., were the same on the 30 and 35 ton cars. Therefore it is believed that a car of the same width, height of floor and height of body recommended for the 30-ton car should be figured on by the committee for any designs that are prepared, including the same 70 cu. ft. volume per ton of 2,000 lbs. capacity, which would give a car of 39 ft. 3 in. inside length, 8 ft. 5 in. inside width and 7 ft. 4 in. height from top of floor to top of plate, the side door and other dimensions being the same.

Other Interchange Freight Cars.—It would be most desirable and economical all round if the dimensions for the lengths, widths and heights selected for standard

year ago rates have been better, and the company's total revenue from its coal tonnage was as great on the reduced tonnage as it had been in the previous year on the larger tonnage. The benefits of the anthracite agreement, however, were not so great as they might have been because of the long time it took to readjust the trade to the reduced production and to close the many contracts made at low rates before the agreement was signed, these contracts extending far into the year. President Wilbur states that the price received for coal did not cover its cost until midsummer. The small demand for anthracite has again caused a great increase in the coal stored, even under the reduced allotments, and large advances have had to be made to the Lehigh Coal Company to carry this coal.

The traffic returns have been marked by a movement of a larger miscellaneous than coal tonnage. This is a most interesting feature on this road, originally built to open up communication with the coal mines. Of course this is the result of the company's expansion in mileage, and its entrance to new territory, chiefly in New York. The ton-mileage for the last two years, and for 1891 and 1890, is given below (000 omitted):

	1896.	1895.	1891.	1890.
Anthracite coal ton-miles	1,265,097	1,293,672	1,025,069	937,363
Misc. freight " "	1,555,587	1,283,200	846,678	744,570
Total " "	2,820,684	2,576,872	1,871,747	1,681,933
Av. ton-mile coal-rate	.646	.640	.832	.841
Av. rate per mile miscel. freight	.480	.534	.702	.710
Av. ton-mile rate on total tonnage	.557	.588	.774	.805
Number pass. carried	5,020	4,748	5,734	5,161
No. pass. carried one mile	126,179	118,282	98,548	86,618
Av. pass. mile-rate	2,020	1,958	2,174	2,258

As compared with 1895, the advance in freight movement is considerable, except in the coal tonnage and coal ton-mileage, which shows a falling off. But while this traffic, once of so predominating importance to the company (as late as 1890 it will be seen it formed more than half of the total ton-mileage), has not increased, the miscellaneous freight has been growing during the past five years by bounds. This, it should be borne in mind, is to no inconsiderable extent due to the extension of the company's lines into new territory which has not been coal producing, nor added specially to the company's markets for coal, although the important terminal improvements have been mainly to facilitate the coal traffic. The anthracite coal tonnage fell off four per cent. from the 1895 total, while the general freight tonnage increased 11 per cent and represented a gain of \$23,000 in earnings. The ton-mileage of anthracite coal decreased two per cent. (bituminous coal ton-miles increased), but the ton-miles of general freight gained over 273 millions, equal to 21 per cent. There was a gain of 10 per cent. in the total ton-miles.

But, as will be seen, the rates have been constantly declining, as on other roads. President Wilbur points out that the loss of .031 cent per ton in the total ton-mileage meant a decrease to the company's income of about \$900,000.

The coal rate, however, seems a very fair one for that traffic. But the average ton-mile rate on general freight and on the total tonnage, 4.8 mills and 5.57 mills, seems low. There is little information in the report which is of much help in this connection. The ton-mile rate on other anthracite coal-carrying roads will be interesting: Buffalo, Rochester & Pittsburgh, 4.66 mills; Central of New Jersey, 9.7 mills; Chesapeake & Ohio, 4.26 mills; Delaware, Lackawanna & Western, 9.3 mills; Erie, 5.89 mills; New York, Susquehanna & Western, 9 mills; New York, Ontario & Western, 8.4 mills; Pennsylvania, 5.6 mills. The anthracite coal rate is not reported separately.

A table of miscellaneous tonnage carried shows grain to be much the largest item of this class, 1,471,000 tons. The tonnage was nearly 50 per cent. greater than in 1895. The earlier reports do not classify the tonnage so that the influence of the Buffalo line in drawing this traffic cannot be shown. The increases and decreases in miscellaneous freight tonnage items vary a good deal in the two years, but the other most noticeable change is in the ore traffic, a loss of 120,700 tons being recorded.

The earnings for three of the years for which the traffic figures were given are reported as below:

	1896.	1895.	1890.
Coal earn.	\$8,623,574	\$8,470,859	\$8,093,361
Misc. freight earn.	7,472,104	6,849,062	5,218,205
Pass. earn.	2,556,736	2,564,549	1,954,048
Total earn.	18,652,414	17,884,470	15,265,614

The Lehigh Valley has added so much to its mileage in the last few years that a brief review of the new lines will be of interest. For some years before the building of the Buffalo extension the miles operated had shown a gradual increase but no decided change. The mileage was 314 in 1881, and in 1888, 355 miles. Since then the growth of the system is shown herewith—

1890.	1891.	1892.	1893.	1894.	1895.	1896.
314	369	1,038	1,023	1,103	1,145	1,295

The Buffalo extension, built in 1891 and 1892, added about 160 miles to the line.

The additions during the year have been the Elmira, Cortland & Northern, 140 miles; the Middlesex Valley, 29 miles, and the Depew & Tonawanda, 11 miles. The last line was built to enable the company to send freight destined for Suspension Bridge and points West over its own line instead of turning it over to the New York Central at Batavia. Under the name of the Greenville & Hudson, the construction of a terminal line, connecting the line at Greenville with its New Jersey docks, has been carried on.

The company has made quite extensive additions to its

Scale of Vote by Cars, in thousands, three ciphers omitted.

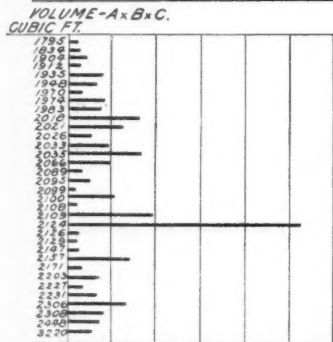
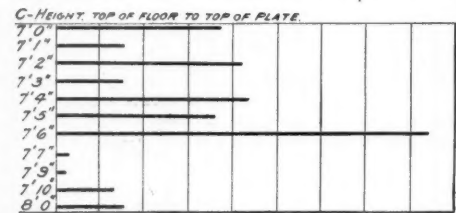
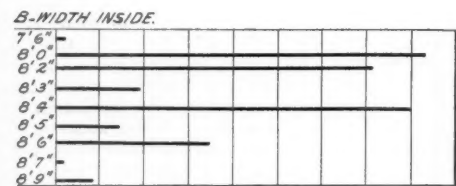
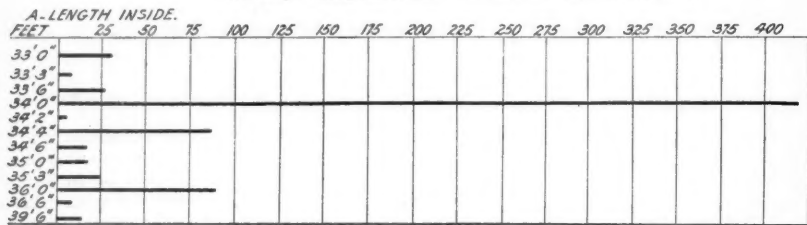


Diagram Showing Summary of Recommendations for the Internal Dimensions for a Standard 30-Ton Box Car, Representing over 840,000 Freight Cars.

would facilitate the introduction of steel framed cars if the designers were to adhere to those dimensions suiting best for the greatest number of progressive railroads so that special designs of trucks would not be necessary for use under these steel-framed bodies. The vote ranged all the way from 2 ft. 1½ in. to 3 ft. 4½ in. A great majority of the vote was cast for dimensions between 2 ft. 8½ in. and 2 ft. 11½ in., the vote being 426,000 cars. Below 2 ft. 8½ in. only 84,000 cars and above 2 ft. 11½ in. 121,000 cars. If the height of the floor is taken as previously mentioned at 4 ft. for convenient height on account of transferring and warehouse work, and to enable the draft gear to be placed between the sills, it will be found that 2 ft. 10 in. for the height from the top of the rail to the top of the center plate will fit in very conveniently for this dimension of 4 ft. and will suit a great majority of the trucks of modern design now in use on leading railroads.

Cars of Capacity Greater than 30 Tons.—It was found that of the 40 leading railroads replying to the circular of inquiry only 15 gave any dimensions for a 35-ton box car, and these varied from 34 ft. inside length to 41 ft. inside length. In many cases those giving dimensions gave the same lengths, widths and heights as they recommended for 30-ton cars. In some cases those reply-

interchange box cars of 30 and 35 tons capacity should be adhered to for stock cars; also if the lengths, widths and other dimensions excepting height are adhered to for gondolas and flat cars so that the sills, bolsters, trucks, etc., of these cars would all be interchangeable.

Summary.—For the inside length of 30-ton box cars, 34 ft.; for the inside width of 30-ton box cars, 8 ft. 5 in.; for the height from top of floor to the top of plate, 30-ton box car, 7 ft. 4 in.; for the inside length of 35-ton box cars, 39 ft. 3 in.; for the inside width of 35-ton box cars, 8 ft. 5 in.; for the height from top of floor to top of plate for 35-ton box car, 7 ft. 4 in.; for the cubic capacity per ton of 2,000 lbs. for all box cars, 70 cu. ft.

The same length of sills and widths to be used for gondolas, stock cars and flats for interchange traffic and the most desirable height for all cars from top of rail to top of floor, 4 ft.; the most desirable height from top of rail to top of upper center plate for all cars, 2 ft. 10 in.; the most desirable width of side doors for box cars, 5 ft. 4 in.; the most desirable dimensions of end doors in box cars, 2 ft. wide by 3 ft. high.

Annual Reports.

Lehigh Valley.—The report for the year to Nov. 30 shows some advance in traffic and earnings over 1895, as that year had recorded an advance over the immediately preceding years. With an increase in gross earnings of \$950,000 or five per cent., net earnings increased eight per cent. The net earnings were \$5,124,000 and the other income was \$482,479. From these figures, however, must be deducted the loss on operation of the Lehigh Valley Transportation Co. and the Morris Canal, and taxes, \$673,366, leaving a net available income of \$4,933,795. After paying the fixed charges there was a surplus of \$449,762. This compares with \$642,842, the surplus reported last year; in 1894 the surplus was only \$127,000. A feature of the income account is the heavy falling off in "other income." Only last year it was \$990,000 and in 1894 it was \$1,036,054, and, excepting in 1893, was even greater in previous years. The surplus given above is the amount stated in the report. It does not take into account the interest on the Lehigh Valley Coal Company's bonds paid by the railroad. This charge amounted to \$590,000 in 1896, and \$596,625 in 1895, and the company charges it as a debit to profit and loss. Subtracting it from the surplus given above, a small deficit is shown on the year's operations. There is no longer any question as to the company's financial condition, which was in doubt but a few years ago. The complications resulting from the Philadelphia & Reading lease, and the withdrawal therefrom, have been straightened out, except as regards a large claim which the company has against the Reading.

The figures summarized above show the results of working the road in a year which was unfortunate and unprofitable for nearly all the anthracite coal-carrying roads. The Lehigh Valley ranks next to the Philadelphia & Reading as an anthracite coal carrier, its percentage of the coal carried in 1896 having been 15.6 per cent.; that of the Reading was 20.7 per cent. President Wilbur states that the total coal tonnage fell off last year 3¼ million tons, of which the Lehigh Valley lost 500,000 tons. Under the anthracite agreement made a

facilities in the past year, and these may be summarized briefly. The most important is the addition of 2,000 box, 1,000 gondola and other freight cars partly paid for through $1\frac{1}{2}$ millions of car trust bonds at five per cent., payable at semi-annual periods in the next 10 years. In addition 50 locomotives were purchased, and the cost of these and the balance of the freight car equipment was arranged for from other sources. The cost of equipment as given in the balance sheet stands at \$23,970,673, an increase of over $2\frac{1}{2}$ millions as compared with last year. During the year \$108,900 has been charged to operating expenses for equipping cars with safety appliances.

The company now loads its engines by tonnage instead of by carloads with a marked increase in efficiency of service. Experiments in mixing bituminous with the smaller sizes of anthracite coal for locomotive fuel have been going on for some months, and it is believed that a large saving in cost will result. Under this same head may be mentioned extensive improvements made to get an adequate supply of water for the locomotives, the drought in Pennsylvania in 1895 having forced this matter on the immediate attention of the officers. A tract of 82 acres was purchased on the Quakake Creek, and a 12-in. pipe over 34,000 ft. long has been laid reaching the 10-in. pipe now in use at Hazleton. The pumps will be delivered in January and are guaranteed to carry to Hazleton 2,300,000 gallons of water each 24 hours. The cost so far has been \$100,000 and nearly \$50,000 has been spent in improving the water supply at other points.

The standard rail section has been changed and the weight increased from 80 to 90 lbs. to the yard, and it is estimated that 7,000 tons of rails will be needed the coming year for renewals and repairs.

Six interlocking plants have been built at a cost of \$23,683, and during the year \$198,000 has been spent in extending the Hall automatic block signals, which are now in use, with few exceptions, between Neshauc, N. J., and L. & B. Junction. A change in the line at Pittston, Pa., has been made, and a new station built there, and \$30,000 has been spent upon the foundations for a new station at Rochester, N. Y., where the company has been hampered by inadequate terminals.

The Lehigh Valley Coal Company has built during the year an extensive coal storage plant at West Superior, and the Calumet dock at South Chicago was put in use in July.

It is proposed during this year to begin to weigh coal at the mines and to run coal trains through from the mines to tidewater without change of engines, avoiding the delays now incident to sending the cars into the yards at Packerton and weighing the coal there.

The Black Diamond express, which was put on in May last has proved popular. The increase in passenger business during the year has been large, but a portion of this is due to including travel on the Elmira, Cortland & Northern. A large portion of the increase, however, is credited to improved train service and activity in soliciting business.

Proposed Railroad Legislation.

The legislative mills have begun grinding at a lively rate in half a dozen states. As usual, a majority of the bills presented are crudely drawn and of varying degrees of uselessness. We note the principal measures affecting railroads which we have found in the daily press dispatches.

In Minnesota there is a bill to reduce passenger fares to $2\frac{1}{2}$ cents a mile and to reduce freight rates 20 per cent.; and another to abolish the State Railroad Commission. In Missouri the Governor in his message, recommends that train robbers be punished by death. Evidently the Governor lives somewhere in the region of the "Blue Cut." In Nebraska there is a bill to forbid the granting of passes on the railroads, though the author of it thoughtfully introduces another to carry all state officers free. In New Jersey there is a bill requiring bicycles to be carried free in baggage cars, and one to create a railroad commission. Another provides that all real estate of railroads shall be assessed for taxes at local rates. In New York, Mr. Emmett proposes that railroads shall sell, to and from the largest cities, 50-trip family tickets, at not over $1\frac{1}{2}$ cents per mile. Another bill proposes to regulate freight charges on railroads which compete with the Erie Canal. Senator McNulty has introduced bills, promoted by Mr. E. M. Grout, of Brooklyn, permitting and regulating municipal ownership of street railroads.

The North Carolina legislature has already passed a law prohibiting the amalgamation of parallel railroads. A bill has been proposed requiring railroads hereafter organized in that state to agree to abide by the decisions of the North Carolina Courts, not availing themselves of their right to carry cases to the Federal Courts. Another bill has been introduced requiring every road doing business in the state to file a copy of its charter in every county on the line. In Pennsylvania, Senator Coyle has introduced a bill to collect \$100 license fee for each buffet or dining car in which liquor is sold. In South Carolina a law is proposed regulating the conduct of receivers of corporations. In South Dakota, Senator Palmer has introduced the Wheeler bill, a railroad measure which was considered in the last session; and in the lower house a bill has been introduced fixing the maximum passenger fare at three cents a mile.

A bill has been introduced in the Lower House of Congress to forbid brokerage in tickets, and it is stated that the Committee on Interstate Commerce has or-

dered a favorable report upon it. The railroad men who went to Washington to ask the Interstate Commerce Commission to extend the time for equipping freight cars with automatic couplers and air brakes state that they do not support the bill which has been proposed in Congress for the extension of the time. The railroad men hold that the Interstate Commerce Commission should deal with the subject, having full power. Senator Chandler, of New Hampshire, having read of the proposed traffic agreement which the Lake Lines are considering, has secured the adoption of a resolution by the Senate directing the committee now considering his former anti-trust resolution to consider the Lake Lines also.

The bill in relation to contempts of court which passed the United States Senate last session has been under consideration by the House Committee, and the Senate bill as amended has been ordered to a favorable report. In its present form it provides that any contempt in the presence of the court may be punished by the court alone, but any contempt outside of the court, except the refusal of witnesses or jurors to attend, must be tried by a jury if the accused so demands.

Mr. S. M. Felton, Receiver of the Cincinnati, New Orleans & Texas Pacific, has issued a circular to the customers of the road at local stations announcing that the principal traffic and operating officers of the road will hereafter make periodical trips over the line for the purpose of making it more convenient for the public to communicate with them. The General Freight Agent, the General Passenger Agent, the Division Superintendent and the Division Freight and Passenger Agents will travel together and will stop at every station. Persons desiring to transact business with any of these officers will, on application to the Station Agent in advance, be advised of the date when the traveling officers may be expected. It is requested that the nature of any business which it is desired to discuss, shall be made known beforehand, so that the proper official may be prepared to intelligently deal with it. The first trip is already in progress, having been begun at Cincinnati on January 14.

The New York, New Haven & Hartford on its present time table, adopted last Sunday, runs an express train from New Haven to New York in the morning in one hour and a half, or at the rate of about 50 miles an hour. This is a marked improvement for the benefit of short distance travel, all of the trains which have heretofore been run at this speed being Boston expresses and therefore of no advantage to passengers traveling toward New York early in the day.

NEW PUBLICATIONS.

The A B C of the X-Rays. By William H. Meadowcroft. New York: The American Technical Book Co., 5 x 7 $\frac{1}{2}$ in.; pp. 189. Cloth, 75 cents; paper, 50 cents.

A few years ago Mr. Meadowcroft placed before the readers of popular science a little book entitled "The A B C of Electricity," nearly 60,000 copies of which have been sold in this country. His new work, "The A B C of the X-Rays," is written in very much the same simple and interesting style which made the first so popular. As suggested by the title, the author treats of the very alphabet of the science, incidentally touching the theory and carefully describing the apparatus used in the production of the X-rays. From the time that Roentgen's discovery became public Mr. Meadowcroft has devoted much time to the study of the various phenomena manifested by passing an electric spark through highly-exhausted tubes, and this book gives some of the results of his researches. Being connected with the Edison Lamp Works, of Harrison, N. J., he has had the opportunity to experiment with a great variety of tubes and his diligence has been rewarded by securing results that are superior to those often obtained and which will compare favorably with any we have seen published. The radiograph, facing page 157, of a hand with a needle in the palm was made by an exposure of but 2 min. 20 sec. It may be of interest to state what the author omits, that the needle was removed without difficulty by a surgeon, after he had examined the photograph.

The analogies throughout the book are carefully drawn, the language is excellent and the statements are clear. Young writers on popular technical subjects will be profited by reading the book simply as an example of an unpretentious style of expression and presentation. The book is suggestive from the beginning to the end and is a safe guide for the young experimenter in obtaining for himself the X-ray photograph, no previous knowledge of electrical subjects being required in order to understand and appreciate the book.

It is illustrated by H. E. Fanshawe and it is a satisfaction to look over a book of this class which contains fine drawings and engravings so well executed. They have all been especially prepared for the work, and add greatly to its interest and value.

Protective Coverings for Iron. By J. Spennrath, Director of the Technical School at Aix-La-Chapelle. New York: Railroad Car Journal, 1896. 6 x 9 in., paper, pp., 40. Price, 50 cents.

Mr. Spennrath has given us a valuable essay on a chemical and physical examination of the paints commonly used for the protection of iron. Early in the work we are told what rust is, and also about the conditions necessary in order that it may form. Here the author

states that the assumption, usually adopted, that rust acts chemically as a medium of oxidation of iron is false; and he later explains that iron rust promotes a further rusting only on account of its physical condition, for in its pores gases are condensed and water is retained, and it is these that act chemically to form the rust. If the rust be ground with oil its capacity to condense gases and hold water ceases, and no further rust can be formed. In the main part of the essay, that treating of the oil paints, the author attacks the common idea concerning soap formation. The idea is said to be false because the pigment in a dried and hardened coat is precisely the same that it was before mixing with the oil. The changes which the coating undergoes while drying relate to the oil only. These statements are fortified by the results of a number of experiments with different pigments. It is pointed out that many of the common pigments are unable to withstand the action of certain atmospheres, and these atmospheres, together with their actions, are given. The results of a number of tests on different paint skins are also given. For these tests the author used a pigment, graphite, which could not be affected by chemical influences. In this way the destroying actions which concern the oil alone were ascertained.

The author's conclusions are drawn from a long series of experiments which he has made, and these appear at the end of the work. In these it is stated that the oil paints are the most effective means for preventing rust; that there is no remedy against the injurious influences attacking the binding material; that priming with oil should be prohibited, but that the last coat should be rich in oil because then it remains elastic for a longer time; that the specific gravity of the pigment should be low, and that the pigment of an oil paint has no influence over the binding material.

Journal of the Western Society of Engineers.—The sixth number of the *Journal of the Western Society of Engineers* has just been issued completing the first volume of over 850 pages. This number contains an engraving of Mr. John F. Wallace, President of the Society for the past year, and on account of the excursion of the Society to Rock Island, Ill., described in *Railroad Gazette*, Nov. 13. Papers and discussions at recent meetings are published as follows: "Steel Forgings," by Mr. H. F. J. Porter, "Electric Traction," by Mr. Edward Barrington, and "The Equipment of Manufacturing Establishments with Electric Motors and Electric Power Distribution," by Prof. D. C. Jackson. Papers in Foreign and American transactions and periodicals on the following subjects are abstracted by the Publication Committee: "Machinery Bearings," by Mr. John Dewrance (Proceed. Institution of Civil Engrs.); "The Substitution of Electricity for Steam in Railway Practice," by Louis Duncan (Trans. Am. Inst. Elect. Engrs.); "Governing of Water Power Under Variable Loads," by Mr. M. S. Parker (Proceed. Am. Soc. Civil Engrs.); "The Efficiency of Hydraulic Dredging," by Mr. A. W. Robinson (*Cassier's Magazine*); "A Method of Reducing the Cost of Electric Supply," by Dr. Rasch (foreign); "Electricity Stations as Centers for the Supply of Light and Power and for Railway Working," by Dr. Martin Kallman, (foreign); "The Hamburg Electricity Works," by Mr. Max Meyer (foreign); "Observations upon Filters of Various Kinds," by Mr. F. Breyer (foreign); "Electric Power in Factories and Mills," by Messrs. F. B. Crocker, V. M. Benedict and A. F. Ormsbee (Trans. Am. Inst. Elect. Engrs.).

Star of the South is the name of a new monthly publication advertising the Seaboard Air Line. The first number contains a copyrighted story with original illustrations, time-tables, information about grape culture and the peanut trade in North Carolina, and another story.

TRADE CATALOGUES.

Coal Washing by the Lubrig Process.—Messrs. Cunningham & Co., 1038 Monadnock Block, Chicago, controlling the Lubrig American and Canadian patents for coal washing and ore dressing machinery, have issued a pamphlet containing considerable information on certain coal washing plants. Fifteen pages are given to a reprint of a paper on "Coal Washing by the Lubrig Process," with a description of a 600 ton plant recently completed at the Crabtree mine of the Alexandria Coal Company, of Greensburg, Pa., read by J. V. Schaefer, M. E., before the American Society of Mechanical Engineers, Dec. 3, 1896. (An abstract of this paper was given in the *Railroad Gazette* on Dec. 11.) A description is then given of a 300-ton Lubrig washery for fuel coal at De Soto, Ill., the essential difference between this plant and that at the Crabtree mine being that the different sizes of coal are kept separate as they come from the jigs. This description is followed by some remarks on the results from certain Lubrig washeries. The pamphlet concludes with a list of coal washing plants erected in various parts of the world up to Dec. 31, 1896. This list shows that 153 plants have been built in Europe, on the Continent, and 25 plants in Great Britain; four plants have been erected in the United States and one in Canada. There are two half-tone reproductions of a 600-ton washery, completed in 1895, at Union Bay, B. C., and one of a 300-ton washery at De Soto, Ill. Plans and elevations of the plants which are described, are also given.

Information on the Preservation of Iron and Steel Structures.—We have just received from the Goheen Manufacturing Co., Canton, O., a pamphlet bearing this title. The matter in the sheet is extracts from "The Preservation of Iron and Steel Structures," by William Broom, and it is thought that it will, in a measure, answer many questions daily asked by paint users relative to the protection of iron and steel. The introduction is followed by some remarks on linseed oil, its chemical and physical properties; and these again by matter relating to first coating, touching upon the practice of shop-oiling and the use of red lead. Oxide of iron and other paints are then mentioned, as also the subjects of a clean surface and the custom of pickling. Mention is last made of carbonizing coating, a paint made by the company. On the inside of the back-cover, two paint tables are pasted. One of these is that of Mr. C. E. Fowler, Chief Engineer of the Youngstown Bridge Co. A copy of the pamphlet will be sent free to any one giving his address.

Boring and Turning Mills.—We have received from the Bullard Machine Tool Co., of Bridgeport (through Mr. N. B. Lyons, New York representative, 145 Broadway), a handsome catalogue of boring and turning mills. This is not designed to comprise the entire product, but refers especially to a line of small vertical boring and turning mills, to which the Bullard Company has given particular attention for some time past, and which are unusually complete in their appointments and of a high grade of workmanship. The skill in design shown in the product of the Bullard shops is well known and the catalogue before us is distinguished by this quality.

Milling Machines.—The Cincinnati Milling Machine Co., Cincinnati, O., sends us a catalogue of milling machines, dated December, 1896. For many years this concern has made an exclusive specialty of milling machines, and its designs involve many novel features. The catalogue is unusually well illustrated, the engravings being wood cuts from photographs; and it is agreeable to see, in these days of cheap illustration by half-tones, the honest distinction of the old-fashioned wood cut. With the pictures are pretty and complete descriptions of the machines. The catalogue is a pamphlet of 48 pages with a good table of contents.

Rolling Mill, Brick Plant and Contractors' Machinery.—Thomas Carlin's Sons, of Allegheny, Pa., have sent us their 11th illustrated, 6 x 9 in., 40-page catalogue which describes the large and heavy rolling-mill machinery made by that company. In the first part of the catalogue, the different styles and sizes of the right-hand bar shears are described and illustrated. Steel derricks, hoisting and stationary engines, rock and ore Blake eccentric pattern crushers, Carlin's patent dry grinding pan and other machinery for special work fill up many of the remaining pages.

The National Master Blacksmiths' Association.—The proceedings of the fourth annual convention of the National Railroad Master Blacksmiths' Association, held at Chicago, Sept. 1 to 3, are issued in pamphlet form. It contains the papers and discussions of this body, a list of members and the constitution of the Association. The Secretary is Mr. G. F. Hinkens, St. Paul & Duluth Railway, Gladstone, Minn.

Dumping Carts, etc.—Messrs. Hobson & Co., Tatamy, Pa., and 2 and 4 Stone street, New York, issue a catalogue of dumping carts, sprinkling carts, etc. A considerable line is shown, covering not only contractors' carts but farm carts.

The Hancock Inspirator, Etc.—The Hancock Inspirator Co., 15 Oliver street, Boston, Mass., issues a new pamphlet describing the Hancock inspirator and giving drawings, price-lists and directions for connecting and operating.

Apprenticeship in Machine Construction.

The *American Machinist* has lately been investigating the present state of the apprenticeship system in machine shops. Letters were sent to many machinery building companies and important railroad systems, asking whether apprentices are taken, and upon what terms, and whether the system has been found satisfactory or not.

Replies were made in 116 cases, and data and opinions were published on Dec. 24, most of the letters being printed in full. Those letters were classified and grouped under different headings in accordance with the kind of machinery built. Under each heading a table was compiled, giving a list of the different firms, except where the names were withheld by special request; whether or not apprentices are taken, and if so whether the system is satisfactory or not; the term of apprenticeship in years, and whether portions of pay are retained or a bond required.

From the builders of stationary and marine engines pumps, etc., 37 replies were received, and of that number of firms, 27 take apprentices, 24 finding the system satisfactory; the terms of apprenticeship average three years and seven months. Out of a total of 35 machine-tool builders who reported, 25 take apprentices, and of that number all but one are satisfied with the system; the terms of apprenticeship average three years and seven months.

Twenty-five replies were received from locomotive

builders and railroad companies. These replies show that 22 of these companies use the system, and that 20 find it satisfactory. All except one of the six locomotive builders who reported, take apprentices, the one having discontinued the system. The average term of apprenticeship in these 22 shops is four years. Eight companies make a written agreement with the apprentices. The system is highly commended by a large majority of these locomotive builders and in the railroad shops.

Nineteen replies were had from builders of miscellaneous machinery, and eleven of these take apprentices, all but one finding the system satisfactory. The average term in these shops is three years and six months.

It is thus seen that of the 116 companies which replied to the letter of inquiry, 85 companies, or nearly three-quarters, take apprentices, and 78 of these express themselves as satisfied with the system, many expressing approval in the most emphatic terms.

American Society of Civil Engineers.

The annual meeting of the American Society of Civil Engineers convened in New York City at 10 o'clock Wednesday morning of this week. The officers elected were: President, Benjamin Morgan Harrod, New Orleans; Vice-Presidents, George Henry Mendell, San Francisco, and John Findley Wallace, Chicago; Treasurer, John Thomson, New York; Directors, Rudolph Hering, New York; James Owen, Newark, N. J.; Henry Grant Morse, Wilmington, Del.; Benjamin Lincoln Crosby, St. Louis; Henry Stevens Haines, Atlanta, Ga.; Lorenzo M. Johnson, Eagle Pass, Tex.

The report of the Board of Direction shows on Jan. 1, 1897, a total membership of 2,018, of whom 451 are resident members. The net increase for the year was 98. The total number of applications considered during the year was 206, of whom 190 were passed to ballot or elected by the board.

The losses by death during the year number 30. They are as follows.—Eighteen members: Job Abbott, William Albert Allen, David Leonard Barnes, Max Joseph Becker, Louis Provost Evans, Francis Renatus Fava, Jr., William Harrison Grant, Robert Lewis Harris, John Houston, Robert Neilson, Norman James Nichols, Albert Franklin Noyes, James Clarence Post, Andrew Jackson Post, Joseph Russell Thomas, Christopher C. Waite, Orlando Belina Wheeler, John Allston Wilson. Two Associate Members: Francis Asbury Lyte, James Hugh Stanwood. One Associate: Waterman Stone. Two Juniors: Vernon Hill Gridley, John Joseph Tallon. Six Fellows: Charles Lewis Colby, Alexander Samuel Diven, Francisco de Garay, James F. Joy, McRee Swift, Thomas Prosser. One Subscriber: George H. Nettleton.

Mr. McRee Swift, Fellow of the American Society of Civil Engineers, left to the Society a bequest of \$1,000 which was received last June, the income to be devoted to the purchase of rare books, etc., for the library. This bequest was made by Mr. Swift, one of the charter members, in memory of his father, General Joseph G. Swift, born 1733, died 1863, the first graduate of the Military Academy, Chief of the Corps of Engineers and Chief Engineer of the New Orleans & Pontchartrain Railroad in 1829, the Harlem Railroad in 1832 and many other undertakings.

The site for the new society house was purchased in the preceding year for \$80,000, \$20,000 of which was paid in cash and the balance, \$60,000, left on mortgage. Competitive designs were received for the new house and that of Mr. C. L. W. Eidlitz was selected. Plans and specifications were prepared, but it was impossible to get a loan on favorable terms until after the Presidential election. The contract for erecting the building was let early in December to Mr. Charles T. Wells, for \$86,775, which, with the cost of excavation already paid, makes a total of \$91,275. Work is begun and it is expected that the building will be done about Oct. 1, 1897. Subscriptions for the new house to the amount of \$19,170 have been received, of which \$17,480 has been paid. To date \$32,263 has been spent on the house, of which \$17,480 is from subscriptions and the balance from the savings of the society. This fact shows the financial ability of the society to carry on the work.

The Board mentions the fact that a sketch of the history of the Society has been written by the Secretary and printed by order of the Board, and will be ready for delivery early in February. Few members know much of the origin and growth of our organization, and there is little accessible information concerning its early history. The meager official records have been amplified by material gathered by investigations in early technical literature and correspondence with members of the society who took an active part in its establishment or in its reorganization. To the facts thus gathered has been added a summary of the more recent development and work of the Society, with a table of its yearly membership, and a diagram showing its growth as compared with that of other leading national societies. The volume will be illustrated with a nearly complete set of portraits of officers of the Society, has been printed in the best manner, and will be bound in full morocco and sold only on subscription at \$10 per copy. There will be a handsome profit to the Society at this price, which will be devoted entirely to the New Society House Fund, as the publication is intended to provide a way by which every person connected with the society may make a small contribution to the new building and at the same time obtain a volume which, it is believed, will prove of great interest to

him as an engineer. Orders for this volume should be sent to the Secretary as early as possible, as only copies enough to meet the demand will be bound.

During the year memoirs have been published of 53 members, 44 of whom died before Jan. 1, 1896. Some of these died many years ago, and the memoirs which have been prepared are interesting additions to the history of the engineering work of our country. Other memorial notices are in various stages of preparation.

The Society had on hand at the beginning of the year \$18,148, received \$49,987, paid out \$56,670, and has a cash balance on hand of \$11,456. The surplus for the current year has materially increased. The net excess of receipts over disbursements is nearly equal to the gain of both 1894 and 1895, and the financial affairs of the Society are on a most satisfactory basis, and all the indications are favorable to further development.

Further report of the meeting will be given next week.

The Fatigue of Wrought Iron and Steel.*

It has been shown by experiment that wrought iron and steel can be loaded and unloaded an indefinite number of times without rupture if the amount of the change of load does not exceed a certain proportionate part of its ultimate strength, and that as this change of load decreases the maximum load may increase. All this is shown graphically in Fig. 1, where the shaded

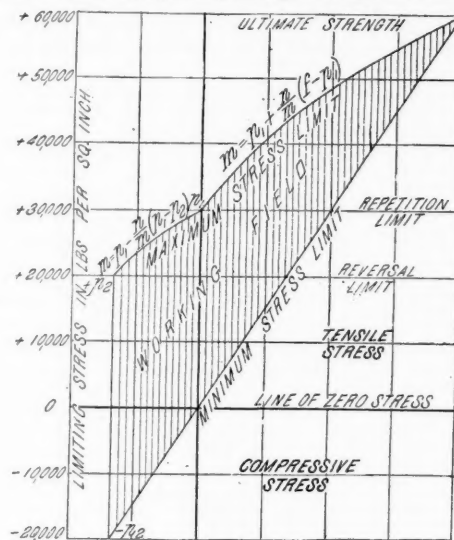


Fig. 1.

area represents the working field, or the limits of stress between which the material (in this case 60,000 pounds steel) can be loaded and unloaded (in part) an indefinite number of times without failure. That is to say, when the changes in load are not greater than those indicated by the shaded part of this figure, the numerous micro-flaws do not enlarge, and hence the gradual fracture, indicated by the word "fatigue" does not develop. In no case does the material become any more crystalline than it was originally. When the load is wholly removed each time, the material can be worked (loaded and unloaded) between zero and the "repetition limit," which is commonly

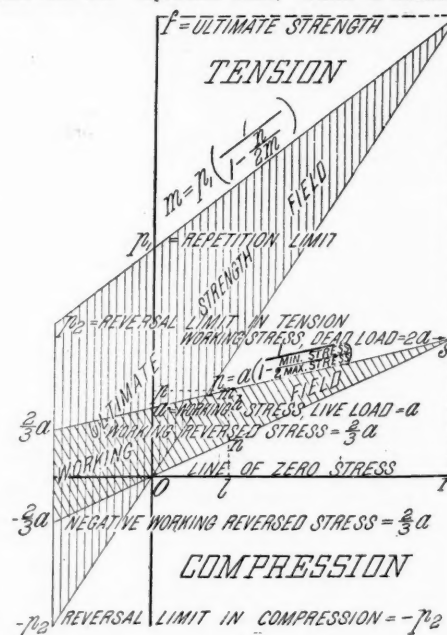


Fig. 2.

taken as one-half the ultimate strength, or, in this case, 30,000 lbs. per square inch. When the load is wholly reversed each time, as in the case of a railroad axle, then the stress changes from tension to an equal compression and back again an indefinite number of times, and then

* From a paper by Prof. J. B. Johnson before the St. Louis Railway Club.

the metal can be stressed in each direction to the "reversal limit," which is taken at one-third the ultimate strength, as shown in Fig. 1.

When a factor of safety is to be introduced, this working field takes the position shown by the diagonally shaded area in Fig. 2. Thus, with a factor of safety of three, loads may be imposed and removed an infinite number of times up to 10,000 lbs. per square inch; but if the load is to be reversed in direction indefinitely, then the load must be limited to 7,000 lbs. per square inch if a factor of safety of three is to be used with low carbon steel. With wrought iron the repetition limit may be taken at 24,000 lbs. and the reversal limit at 16,000 lbs. per square inch.

TECHNICAL.

Manufacturing and Business.

The annual meeting of the stockholders of the Buckeye Malleable Iron & Coupler Co. was held at Columbus, O., Jan. 12, at which a two per cent. quarterly dividend was declared. The following Directors were elected for 1897: W. F. Goodspeed, R. M. Rownd, David Greene, James Timms, T. P. Linn, of Columbus, O.; F. Rockefeller, of Cleveland, O., and Thomas Goodwillie, of Baltimore, Md. The Directors elected W. F. Goodspeed President and Treasurer; R. M. Rownd, Vice-President, and John E. Howe, Secretary.

Albert Waycott & Co., dealers in railroad supplies, iron and steel, have removed their offices to 707 Market street, St. Louis.

The Gates Iron Works, of Chicago, manufacturers of rock and ore-breaking machinery, are preparing plans and estimates for a considerable number of rock-crushing plants for various railroads to be erected this year. The prospects for an active year are very bright. Recently a large plant has been ordered by a new railroad company in Mexico. The Gates Iron Works ship a very large amount of machinery to foreign countries. An interesting shipment from New York in the past few weeks comprised 14 carloads of mining machinery to Johannesburg, South Africa. The firm has had a shipment of machinery on every steamer leaving New York for South African ports within the last three years.

The Bucyrus Company announces that it has taken over the plant and business of the Bucyrus Steam Shovel & Dredge Co., South Milwaukee, Wis. It will continue to make all types and sizes of dredging and excavating machinery for every purpose. Its steam shovels are of new design and construction. A specialty is also made of both light and heavy dredges, in the dipper, elevator or hydraulic types. For the latter type a line of centrifugal dredging pumps are built having simple, compound or triple expansion engines directly connected up to 1,000 H. P. or more. The company also builds pile drivers, wrecking cars and placer mining machinery. It proposes to enlarge its crane department and to manufacture not only locomotive cranes, but also special and power cranes of all descriptions. The officers of the new company are H. P. Eells, President; A. B. Stetson, Superintendent; A. W. Robinson, Engineer, and J. M. Millman, Secretary and Treasurer.

The Cornwall & Lebanon road, in Pennsylvania, is to equip 500 coal cars now in service with air brakes and M. C. B. couplers.

The recent fire at the East Boston plant of the Boston & Lockport Block Co. will not seriously interfere with filling the contracts now on the company's books or future orders. The loss was principally on buildings and stock, the larger part of the machinery being in other departments. The engine and boiler houses were saved and the machinery is now running as usual.

The firm of Horley, Brummer & Co., public accountants and auditors, has been formed with offices at 7 Pine street, New York City. The members of the firm formerly had separate offices, as T. R. Horley and Brummer & Co.

The Mack Injector Co., of Boston, will remove to Lynn, Mass., and will occupy the old power and electric light station of the Lynn Gas & Electric Co. The firm manufactures steam injectors for locomotives, besides a general line of machinery business.

Judge Allen, of the United States Court, has appointed Walter C. Arthur Receiver of the Mount Vernon Car Manufacturing Co., of Mount Vernon, Ill.

The Mexican National has just placed an order with the American Wood Preserving Co., of Philadelphia, for a large quantity of woodline. This road began the use of this wood preservative about a year ago, when a considerable quantity of the liquid was ordered. Its experience of a year with the preservative, under severe conditions, has resulted in this increased order.

S. F. Miller, who for the past ten years represented the Valentine Co. and the Hildreth Varnish Co., is now connected with the Detroit White Lead Works, of Detroit, Mich., and will have charge of its railroad department.

Iron and Steel.

The Pennsylvania Bolt & Nut Works, Lebanon, Pa., which had been idle about a month, resumed on Jan. 11, employing nearly 1,000 men. It is expected that the plant will run steadily for several weeks.

The Granite City Steel Works, in East St. Louis, resumed operations on Jan. 11 after an idleness of several months, and will now run day and night, employing 500 men.

The H. C. Bowen Foundry Co. has been incorporated

at Providence, R. I., with a capital stock of \$50,000, by Henry C. Bowen and Elisha C. Mowry, Providence; Sea bury W. Bowen, Fall River, Mass.

Operations were resumed in the Bessemer and rail mills of the Pennsylvania Steel Co. on Jan. 11. A steady run for at least several months is expected. The machine and bridge and construction departments are very busy. The company has received a number of rail orders from electric roads and an important order from the Metropolitan of New York.

The North Works of the Lackawanna Iron & Steel Co., at Scranton, Pa., resumed work on Jan. 14, after several months' idleness. With the resumption of the South Mills the week before, the entire establishment is now in operation, employing 3,000 workmen.

New Stations and Shops.

The Baltimore & Ohio is tearing away the old hotel at Grafton, W. Va., owned by the company, preparatory to building a new passenger station and enlarging the freight yards. The new station will be one of the largest on the line, and a train shed will also be built.

The Baltimore & Ohio has prepared plans for an electric light plant at Benwood Junction, W. Va., which will furnish light for all the yards, depots and other buildings between Wheeling and Bellaire, including those in both cities. The plant will have capacity for supplying about 1,000 arc lights, and as many incandescent lights.

The Pittsburgh, Wheeling & Kentucky, operated by the Pennsylvania, will begin work in a few weeks upon a new classification freight yard at Wheeling, W. Va.

The Norfolk & Western station at Graham, Va., was burned last week. The building was erected in 1890, and cost \$25,000. It will be rebuilt.

Work is expected to be begun in February on a new depot at Corsicana, Tex., for the Houston & Texas Central and the St. Louis Southwestern, to cost over \$15,000.

The newspaper reports in regard to the proposed changes by the Great Northern at Spokane, Wash., are highly colored. There is no immediate prospect of the company carrying out plans for independent terminals at that point. Surveys were made and some right of way acquired for an independent line at Spokane at the time of the original construction, which, no doubt, will some time or other be built with the stations and bridges necessary. The work now going on consists merely in strengthening the high bridge of the Seattle, Lake Shore & Eastern.

A new passenger station 27 ft. x 67 ft. has just been completed at Wauseon, O., by the Lake Shore & Michigan Southern.

December Pig Iron Production.

A still further increase in the pig iron production of this country took place during December, there being at the end of that month 154 furnaces in blast, with a capacity of 159,720 gross tons per week, as against 147 furnaces, producing 142,278 tons at the beginning of the month. The furnaces blown in during December were as follows: One Troy, in New York; Wharton, in New Jersey; Rebecca, in Western Pennsylvania; one Sharon, in the Shenango Valley; Bellaire, in the Wheeling District; three of the Illinois Steel Co., in the Chicago District, and Mattie and Tod, in the Mahoning Valley. Furnaces blown out were: Atlantic and Neshannock, in the Shenango Valley, and Ivanhoe, in Virginia. The following table, compiled from figures taken from the *Iron Age*, shows the general location and condition of all the furnaces in the country on Jan. 1:

Location of furnaces.	Total No. of stacks.	No. in blast.	Capacity per week - tons.	No. out of blast.	Capacity per week - tons.
Pennsylvania.....	172	65	78,216	107	58,206
Ohio.....	54	23	20,784	31	14,716
The South.....	117	37	30,411	80	36,305
Other Districts.....	120	29	30,509	91	62,995
Total.....	463	154	159,720	309	172,222

Lake Superior Iron Ore Production.

The *Iron Trade Review* states that the total output of iron ore from the Lake Superior region during 1896 was 9,934,446 tons, nearly half a million tons less than that of 1895. The Mesabi Range leads all others, with 2,882,079 tons, which, however, is an increase of only about 100,000 tons over 1895, while the Marquette Range, with 2,603,839 tons, shows an increase of over 500,000 tons. The greatest decrease in production was in the Gogebic range, which produced 1,799,971 tons, or 748,005 tons less than in 1895. The following table shows the total production in gross tons of all the ranges for 1896 and 1895:

Ranges.	1896. Gross tons.	1895. Gross tons.
Mesabi.....	2,882,079	2,781,587
Gogebic.....	1,799,971	2,547,976
Marquette.....	2,603,839	2,091,838
Menominee.....	1,560,467	1,923,798
Vermillion.....	1,088,090	1,077,838
Total.....	9,934,446	10,429,037

The Speed of the Terrible.

The new British cruiser *Terrible*, in her trial trip on Jan. 9, over a 23-mile course off the Cornish coast, developed a speed of 22½ knots per hour. The ship was launched at Glasgow in 1895. She is built of sheathed steel. Her length is 500 ft. and her beam is 71 ft., while the maximum draft is 27 ft. She has twin screw propellers and her boilers, which are of the Belleville type, have an indicated horse-power of 25,000. She is rated as a protected cruiser, the armor extending over the whole

length of the ship. In its thickest part it is 4 in. and tapers to 3 in. at the end. Her coal capacity is 3,000 tons. Her armament consists of two 9 2-10-in. guns, twelve 6 in. quick-firing guns, sixteen 12-pounders, twelve 3-pounders, nine machine guns, two light guns for a boat and four torpedo tubes.

Boston Terminal Station Contract.

The Boston Terminal Company has awarded the contract for the steel work of the new Southern Union Station trainhouse to the Pennsylvania Steel Company, of Steelton, Pa. The Pennsylvania Steel Company built the Northern Union Station, in Boston, for the Boston & Maine, and has furnished the steel for three sections of the Boston Subway. The Southern station is one of the largest contracts of its kind ever placed, requiring 14,000,000 lbs. of steel. This will require nearly 600 cars to transport it, which would make a continuous train over three miles long.

British Rail Exports.

The figures of British rail exports in 1896 up to Nov. 30, show a total of 532,030 tons, as compared with 344,027 tons during the same period in the previous year. We have not yet the figures for the entire year, but those given indicate a marked improvement, especially so as the advance of 1895 over 1894 was only 30,000 tons. The greatest export was to British India, viz., 236,415 tons, as compared with 128,154 tons during the same period in 1895. The greatest per cent. of increase was from the Argentine, the shipments to that country to Nov. 30 being 70,914 tons in 1896, and 12,877 tons in 1895. The figures show that up to Nov. 30, 43,077 tons were sent to South Africa, as compared with 10,965 tons in 1895, and the Australasian colonies received 58,424 tons, as compared with 34,095. A large increase is found in the shipments to Japan, sent 47,338 tons, as compared with 27,370 tons in the previous year. Total shipments for this period, to Egypt, were 14,867 tons in 1896 and 10,863 tons in 1895; those to Mexico were 17,544 tons in 1896 and 5,067 in 1895.

Boiler Coverings.

At the December meeting of the New England Railroad Club, a discussion was held on the subject of "What are the best and most economical forms of Boiler Coverings?" Mr. John Medway, Superintendent of Motive Power of the Fitchburg Railroad, stated that a series of tests had recently been made to determine the relative non-conducting qualities of the three kinds of boiler covering used on that road. The locomotives carried a uniform pressure of 130 lbs. and the room temperature was uniform. Four readings of thermometers were taken at intervals of five minutes respectively on the bare boiler shell and outside surface of lagging. From the difference in the average temperature of each position was found the per cent. of heat radiation through lagging. The results were as follows:

Asbestos air cell, 1 in. thick.....	50.9 per cent.
Magnesia blocks, 1½ in. thick.....	51 " "
Asbestos plaster, 1½ in. thick.....	64 " "

The use of wooden lagging has been discontinued on that road and it was not included in the tests. Air cell covering is made by folding over portions of asbestos paper, thus forming an air passage from one end of the section to the other; care is necessary in applying this covering to make every joint air-tight. A sample of locomotive lagging received from Mr. Robert Miller, Superintendent of Motive Power of the Michigan Central, was shown. It consisted of loose mica sheets about three-quarters of an inch thick. Mr. Miller stated that it was in use on one locomotive on the Michigan Central, but said nothing as to its efficiency.

Steel Making in Japan.

It was announced some time ago that the Japanese government would build a steel plant, but until recently no details of the plans have been made public. At the last session of the Diet a grant of 4,095,700 yen was made to build such a plant, and according to the scheme drawn up by the government the works are designed to produce 60,000 tons yearly, consisting of 35,000 tons of Bessemer steel, 20,000 tons of Siemens-Martin steel, 4,500 tons of wrought iron and 500 tons of crucible steel. The ore will be all be obtained from Japan, the chief supply being large quantities of magnetic iron ore found in the neighborhood of Kamaishi, in the North. Experiments have also been made on the iron-sand, which is common in Japan, and it has been found that it can be used in the manufacture of Siemens-Martin steel, the only difficulty coming from silicate of iron formed by a combination of the iron-sand with the silica in the bricks used in the furnace. Experiments were made with different kinds of fire brick, and it is said that by a proper selection of material, bricks were produced of great heat-resisting power, and in every way suited for use in the manufacture of steel by this method. Mr. Oshima, Chief Engineer of the proposed works, accompanied by a delegation of Japanese officials, is making a tour around the world for the purpose of inspecting important steel works in America, England, Germany and France. After a careful study of the most improved appliances and methods, Mr. Oshima is authorized to purchase all the machinery and plant necessary for a complete establishment in Japan. It is proposed to build the works in the neighborhood of the large coal fields in the south of that country.

Electric Locomotive Transfer Table.

An electrically-driven locomotive transfer table, the mechanical part of which was made by the firm of Hermann Prollius, Goerlitz, Prussia, and the electrical part by Siemens & Halske, has recently come into use in Germany. The motor, which stands unprotected on the platform of the table, drives through a raw-hide pinion

and a cast-iron spur gear wheel a shaft, which may be connected by a coupling with either the table-shifting gear or an endless cable drum, which enables the car to be hauled on and off the table—a convenience that would be appreciated in shops and yards where parlor cars are made to run up a grade in order to take them on or off of the table. The drum axis is hollow, and may be clutched on to the motor-shaft, which it surrounds, or may be freed therefrom so that the rope may be unwound without hindrance from the gears of the motor. The motor is reversed by switching the current into a reverse direction. In order to provide for handling the table in case of failure of the current or damage to the electrical apparatus, there is a special hand gear on the platform. The current is taken from overhead wires by trolleys at the top of an upright pillar, which is secured to the transfer-tables.

THE SCRAP HEAP.

Notes.

On Oct. 27, the birthday of Mr. H. B. Plant, the employees of the Plant System planted trees around the stations and section-houses, about 600 trees in all.

On Tuesday night of last week the officers of the Seaboard Air Line gave a banquet at Southern Pines, N. C., to "the commercial travelers of the country."

The Central of Georgia is said to have secured several hundred families from Northern Wisconsin and Minnesota to settle at a point on its line between Macon and Americus.

The Wells Fargo Express Co. will, on April 1, supersede the United States Express Co., on the lines of the Chicago Great Western, the total length of road covered being about 930 miles.

It is reported that at a number of small towns in Nebraska the express companies have given notice that the practice of delivering goods to consignees, heretofore in vogue, will be discontinued.

From Newark and other points in New Jersey it is reported that the workmen in the shops of the Pennsylvania Railroad have been placed on full time, 54 hours a week. For some time past they have worked only 40 hours a week.

The failure of the Pacific Railroad funding bill in Congress was celebrated in California on Jan. 16, that day having been proclaimed a public holiday by the Governor. In the large cities there were mass meetings, bonfires and fireworks.

Chicago press dispatches report that on some of the Western railroads the trainmen and express messengers have been instructed to pursue a more vigorous course with train robbers. It is said that on some lines standing rewards have been offered.

A line of sleeping-cars has been put on between Washington, D. C., and Chicago, via Cincinnati. The cars run over the Baltimore & Ohio, the Baltimore & Ohio Southwestern, the Cincinnati, Hamilton & Dayton and the Louisville, New Albany & Chicago.

The Cincinnati, New Orleans & Texas Pacific has announced prizes to track foremen, to freight conductors and to yard conductors. The conductors' prizes will be \$40, to be given semi-annually. Enginemen and firemen also receive rewards for good records for economy.

The locomotive enginemen and firemen of the Wabash road, heretofore under the direct supervision of the Master Mechanics, have been transferred to the Transportation Department and will hereafter receive their orders from the Superintendents, though remaining subject to the Master Mechanics while on duty at the engine-houses.

Governor Griggs, of New Jersey, in his annual message, discussing the difficult problems connected with the abolition of grade crossings in several cities of that state, calls attention to the need of a State Railroad Commission, or a body with the powers usually exercised by such commissions, to deal with the crossing and other problems.

The St. Paul Globe reports that the Consolidated Canal & Lake Company, lately organized in New York, to run boats through the lakes and the canal, has let contracts already for the construction of 30 boats. No definite details are given, but the report apparently indicates that the vessels are to be steel canal-boats similar to those heretofore run between Cleveland and New York.

On Sunday, Jan. 10, the Cleveland, Cincinnati, Chicago & St. Louis ran a special train from St. Louis to Cleveland, 545 miles, in 11 hours, 18 minutes, equal to 48.23 miles an hour. One hour and 23 minutes was consumed in stops, engines having been changed three times and half an hour taken for luncheon at Indianapolis. Leaving out the stops the time was 9 hours, 55 minutes, equal to 54.96 miles an hour. Speed had to be slackened in many places, so that to make this time it must have been necessary to run a good deal of the way very much faster than the average. In point of fact the speed was kept up to 60 miles an hour or above practically all the way, except where stations or yards necessitated slackening. From Granite City to Litchfield, 48 miles, the train ran in 49 minutes; from Galion to Cleveland, 80 miles, in 82 minutes. Several short stretches of three or four miles were run at about 75 miles an hour. The weight of the cars was about 200 tons.

Governor Pingree, of Michigan, in his first annual message to the Legislature of that state, devotes his attention largely to taxation and the regulation of cor-

porations. He says that taxation in the state is now unequal and recommends a general readjustment of the laws on the subject. The Governor seems to think that the corporations, although they largely or wholly support the state government, do not bear their proper share of the taxes. He recommends action on railroad fares. The Chicago & Grand Trunk is allowed to charge only two cents a mile, while the Michigan Central charges three. He seems to think it wrong that a passenger, after riding over the New York Central at two cents a mile, should have to pay three cents on the Michigan Central, which is owned by the New York Central interest. For the better regulation of corporations the Governor suggests more thorough publicity and detailed supervision. He recommends that the laws permitting the granting of franchises to street railroad companies, etc., be amended so as (1) to reserve the right to fix fares; (2) to have the plant constructed under the supervision of the city, so that the actual cost shall be shown; (3) to limit bonds to half the cost; (4) require full and detailed reports; (5) to forbid consolidation; (6) to forbid renewal of franchises; (7) to make franchises valid only after they are approved by a vote of the people. The Governor says that the agitation for good wagon roads must wait until equal taxation has been secured. Taxation for roads now bears too heavily on the farmers.

Rapid Transit as It Is.

The post-office department has signed a contract for a pneumatic tube connecting the New York and Brooklyn post-offices by way of the Brooklyn bridge. Now if some company would contract to build a larger pneumatic tube, or some other device, to deliver trunks and baggage from the Grand Central depot in New York to points across the river in the same year they are checked, the inhabitants of Brooklyn would begin to feel as though they were really on earth.—*Springfield Republican*.

Saw Mill Operated by Electricity.

The saw mill of the American River Land & Lumber Co., which is located close to the power-house of the Folsom Sacramento Power Transmission at Folsom, Cal., was successfully started the first of last month, cutting 50,000 ft. of lumber a day. The saw mill is the first in the country, and we are probably safe in saying the first in the world, which is operated entirely by electricity. The current is three-phase, taken from the power-house at Folsom, and the motors are all of the induction type. The motors employed are one of 75 H. P., one of 50 H. P., both running at 720 volts; three of 30 H. P. and one of 5 H. P., operating at 230 volts. These were installed by the General Electric Company.

The Russian Railroad Through Manchuria.

The details of the agreement between Russia and China regarding the construction of a railroad through Manchuria have been reported to the State Department by the Consul-General at St. Petersburg. The association has been organized under a convention concluded Aug. 27, 1896, by the Chinese government for the construction and exploitation of a railroad within Chinese territory from a point on the western frontier of Heilung Chang to a point on the eastern frontier of Kirin, and to be connected with the Russian-Siberian line. The company is granted concessions to work coal and other mines and to conduct industrial and commercial enterprises in China in connection with the railroad or separately. An important stipulation provides that shares can be held only by Russian and Chinese subjects. The company will own the road 80 years after the opening of the whole line. After 80 years the road reverts to the Chinese government. China agrees that baggage and merchandise shall have free transit through its territory without taxes, if destined for a Russian station, and goods imported into China over the road pay only half the usual customs duty. Neither country exacts duty for materials used in construction. The stock capital of the road has been fixed at five million paper roubles (\$2,570,000) divided into 1,000 shares, but bonds will be issued, as required. The offices of the company are in Peking and St. Petersburg, and meetings may be held at either place. The President of the road is appointed by China, but the nine directors are to be elected by the shareholders and the directors elect the Vice-President. The company must begin work in August, 1897, and the line is to be completed in six years. The total length of the Manchurian line will be 1,273 miles, of which 945 is in Chinese territory and it saves 341 miles over the Amur line to Vladivostok.

The Engineers' Club.

The annual meeting of the Engineers' Club, New York, was held last Tuesday evening. Commodore Charles H. Loring, Chief Engineer, United States Navy (retired), was re-elected President. The membership at the close of 1896 was: Resident, 342; non resident, 298; total, 640. The club had on hand net assets of \$22,000, of which about \$17,000 was cash. Deducting the cash on hand at the beginning of the year, the receipts during 1896 were about \$53,000.

The club will move early in February to a new home at 374 Fifth avenue. This is a large and handsome house, considerably more dignified than the one now occupied by the club and containing more bedrooms and offering more accommodations in every way to the members. It has a very handsome entrance on Fifth avenue, and it is believed that the change will make the club more popular and membership in it more sought for than heretofore, although there is no reason to complain of the past, inasmuch as the club in the eight years of its life has acquired a membership of 640 and has assets, all debts paid, of almost \$22,000. The fact is, this is an illustration of what can be done with a club by consistently good government. The Engineers' Club has had the good sense to keep in office a group of responsible men, who have been diligent and painstaking and interested in the success of the organization, and have managed it much as they would have managed their own business.

LOCOMOTIVE BUILDING.

The Midland Terminal road of Colorado, has ordered five engines from the Schenectady Locomotive Works.

The Texas Midland placed orders for three locomotives to the Schenectady Locomotive Works this week.

The Baldwin Locomotive Works are reported to have an order for 10 locomotives for the Kansas City, Pittsburgh & Gulf, which has been mentioned previously.

H. K. Porter & Co., of Pittsburgh, have received con-

tracts for two compressed air locomotives, 18-in. gage, one for a copper mine in Montana and the other for a silver mine in Idaho.

CAR BUILDING.

The Wells & French Co., of Chicago, is reported to have an order from Armor & Co. for building 200 cars.

The Youngstown Car Mfg. Co. is reported to have an order for 125 cars from the Osborn-Saeger Co.

The Atlanta, Knoxville & Northern is building a number of new cars at its own shops. The number will probably be 100.

The report printed last week that the Middleton Car Works had an order for 150 cars from the Berwind-White Coal Co., was an error.

The Colorado Midland awarded contracts for 180 cars to the Pullman Co. this week. The Receiver will soon be in the market for 20 refrigerator cars.

The Portland & Rumford Falls road in Maine, has 25 box cars under construction by the Pullman Car Co., to be equipped with air-brakes and couplers, which will be delivered early next month.

The Carnegie Steel Co. has placed an order with the Weimer Mfg. Co., of Lebanon, Pa., for 16 patent steel cinder cars to be used at the Edgar Thomson furnaces at Bessemer, Pa. The cars will weigh about twenty tons, and will be of 20 tons capacity.

The Southern Railway is now having built by the Pullman Palace Car Company four combination passenger and baggage cars, which will be run on the Washington & Southwestern vestibuled limited train. These cars will be ready for delivery by Feb. 15.

BRIDGE BUILDING.

Astoria, Or.—It is stated that bids will be received until Feb. 3 for building a 90-ft. iron or steel drawbridge over Young's River, and also a 130 ft. iron or steel bridge at Seventh street. F. I. Dunbar is County Clerk.

Bridgeport, O.—The Commissioners of Belmont County have let the contract to the Wrought-Iron Bridge Co., Canton, O., for the new superstructure for the bridge over Wheeling Creek here. The bridge will cost \$995, the old one going in part payment. The abutments will not be disturbed.

Brooklyn, N. Y.—The joint Committee on Bridges of the Brooklyn Board of Aldermen and the Queens County Board of Supervisors have lately discussed plans for the new bridge over Newtown Creek from Manhattan avenue, Brooklyn, to Vernon avenue, Long Island City. The plans were submitted by Engineer John McLaughlin, and introduced some new features conforming to the directions of the War Department. There is to be a clear waterway of 120 ft., and the span will be 180 ft. The total estimated cost is about \$300,000.

Catawissa, Pa.—In the matter of the application of the Commissioners of Columbia County to have the state rebuild the bridge over the Susquehanna, which was destroyed by a wind storm last September, the viewers appointed by the Dauphin County Court have recommended rebuilding it at a cost of about \$70,000 complete.

Elkton, Va.—The contract for the 450-ft. bridge over the Shenandoah at this place, for which bids were opened Jan. 5, has been given to the Vulcan Road Machine Co., Charlestown, W. Va., at \$5,950.

Guelph, Ont.—The City Council will spend \$4,600 for building small bridges.

Hamilton, O.—It is stated that County Engineer Weaver has been directed to prepare plans for an iron bridge over the Hydraulic Canal at Block street.

Harrisburg, Pa.—The grand jury has recommended that bridges be built over Armstrong Creek on the road leading from Enders to Spannuth Mill, and over Deep Creek, in Lykens Township.

Lennoxville, Que.—Tenders for rebuilding the bridge near Capelton, known as the Wilson bridge, are being received by Mr. W. W. Baker, of this town.

Marietta, O.—The City Council has granted the Marietta & Williamstown Bridge Co. a franchise for a combined railroad, electric road and a highway bridge across the Ohio River at this point. The franchise guarantees all roads equal rights in the use of the bridge, and requires that it be completed in three years.

Menasha, Wis.—The contract for building a 549-ft. bridge, with 18 ft. roadway and 7-ft. sidewalk, over Fox River, has been given to the Chicago Bridge & Iron Co. for \$16,000.

Montreal, Que.—The Chateaugay & Northern Railway in order to extend its line through L'Assomption and Montcalm counties has asked the Quebec government for \$50,000 toward building a bridge at Bout de L'Isle. The bridge would be for electric road and vehicles, and is estimated to cost \$225,000.

New York.—A bill appropriating \$25,000 for a bridge over the New York & Putnam, at Parsons, otherwise East 23rd street, has been introduced in the senate at Albany.

At a recent meeting of the New East River Bridge Commissioners, it was decided to adopt an amendment to the act under which the commission is building. This amendment seeks for authority to make a straight approach on the Brooklyn side of the river and for the closing of such highways as may be included in the scheme. It also asks the right, under condemnation proceedings, to take immediate possession of property necessary for the building of the bridge. The amendment will be sent to the legislature.

Ottawa, Ont.—The St. Mary's River Bridge Co., capital \$500,000, is applying to the Dominion government for a charter to build an international bridge, over the St. Mary's River at Sault Ste. Marie, with power to amalgamate with a company to be incorporated by the legislature of Michigan.

Pittsburgh, Pa.—The resolution authorizing the preparation of plans for new bridges over the Pennsylvania Railroad at Penn. Shady and South Highland avenues has been passed by the Councils. The Consolidated Traction Co. has agreed to assume the larger part of the expense for rebuilding the bridges.

Reading, Pa.—Council has passed a resolution directing the preparation of an estimate on the cost of a bridge at Spring street.

Seneca Falls, N. Y.—The projectors of the electric road from Seneca Falls to Auburn have completed plans for an iron bridge across Cayuga Lake from the Bayard

street road to Cayuga. It is stated that work will be begun early in the spring. N. H. Becker and W. C. Gray, of this place, are interested. The capital stock of the company is \$500,000.

Sioux City, Ia.—The Chicago, Milwaukee & St. Paul has begun preliminary work for the building of a steel bridge to replace the old frame structure which spans the Floyd River at a point immediately south of Fourth street.

Tiverton, R. I.—A joint resolution has been introduced in the House authorizing the Secretary of War to make a survey of the Seconnet River at this place for the purpose of determining the location for a draw-bridge to replace the two old bridges.

Washington, D. C.—The House has passed bills providing for bridges over the Cumberland and Tennessee rivers, Kentucky, to be built by the Tennessee & Cairo; two bridges over the Red River of the North, to be built by the Duluth & North Dakota, in North Dakota and Minnesota; a bridge over the Monongahela River, Pennsylvania, at Mifflin Township, by the Union Railroad Co.; a bridge over the Red River, at Alexandria, La., by the Kansas City, Watkins & Gulf; also a bill authorizing the Columbia & Red Valley to build a bridge across the Columbia River in Washington.

The President has approved the act for a bridge across Caddo Lake, in Louisiana; and the act for a railroad bridge across Black River, La.

Wilkes-Barre, Pa.—The Grand Jury has recommended the building of a bridge over the west branch of Codorus Creek, between Jackson Township and North Codorus Township.

Wingham, Ont.—Mr. John Ansley, County Commissioner, is calling for tenders for rebuilding the Bannockburn bridge of steel or iron. The bridge is to be 80 ft. long, with floor 16 ft. wide. It is to be supported on four cylinders 3 ft. in diameter and 10 ft. long, to be filled with concrete. The site is about two miles from Brucefield station, on the Toronto, Hamilton & Buffalo.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In Illinois it is held that a highway having been laid out, crossing the right of way of a railroad company, without compensation having been made, a subsequent stipulation by the company that its damages were not substantial, but merely nominal, was not a waiver of its right to compensation, which would revert back to the laying out of the highway so as to give the highway a legal status, and render the company liable for the expense of constructing a proper crossing and cattle guards.¹

In Texas it is held that a carrier is responsible for damages to a shipment of horses resulting from a negligent delay, though the inherent propensities of the horses may have contributed to the result.²

In North Carolina it is laid down that the statement of a carrier's agent to a shipper at the place of destination, when told by the latter that he would have to sue the company for damage to cattle, that the shipper need not do that, but could get his money without suit, is a waiver of a stipulation requiring written notice to the agent at the place of destination as a condition precedent to a claim for damages.³

Injuries to Passengers, Employees and Strangers.

In New York it is decided that the presumption that a contract for shipment, made with plaintiff by defendant carrier in Massachusetts, was intended to be governed by its laws, by which the clause exempting the carrier from liability is void, is not overcome by the fact that defendant was a New York corporation, and plaintiffs residents of New York, and that the stock shipped was to be delivered in New York, especially where, indorsed on the contract, there was a provision, exempting the carrier from liability for injury to the persons accompanying the stock, which expressly provided that any question arising thereunder should be determined by the laws of New York.⁴

In Texas, where a contractor engaged in building a railroad pulled down fences, and allowed them to remain down, without constructing proper cattle guards, the railroad company was held liable for the damages caused thereby.⁵

In Utah, B. turned his cattle upon the highway, unattended by any person. His dog drove them to a point between two railroads, which were about 80 yards apart, when he left them, and went home, in view of B., who made no further effort to drive them across defendant's track to their pasture, where they were to go. All had crossed defendant's track but one, which remained behind the wing fence extending out from the cattle guard; and when defendant's passenger train, running at a speed of 40 miles an hour, approached, the cow ran in the direction of the other cattle, on to the track, and was killed. The engineer had sounded the whistle for the crossing, and, upon observing the cow moving from the wing fence, gave a succession of short blasts, but was too close to stop the train, and made no effort to stop. The place of the accident was a mile or more from any town. The Supreme Court rules that the engineer was not guilty of negligence, and that the railroad company was not liable.⁶

In West Virginia it is held that the mere fact that cattle were found lying beside the track, with injuries from which they died, did not show negligence on the part of the railroad company rendering it liable for the killing of the cattle.⁷

In Utah it is held that one accompanying sheep in transit on a railroad as an attendant, under contract between the shipper and the company, is entitled to protection as a passenger on the train, regardless of any clause in the contract exempting the company from liability to him as such.⁸

In Texas it is decided by the Supreme Court that where a railroad sold a return ticket to a point on a connecting line, under conditions printed thereon, providing that the company acted only as agent of the connecting carrier and was not liable beyond its own line; that no agent of any line could modify its conditions; that the ticket was good for return only after the holder had been identified by the agent of the connecting line at the destination point and the ticket officially executed by such agent in the manner provided therein, the company issuing the ticket was liable for the expulsion of the purchaser from one of its trains on the return trip because the ticket had not been duly executed by the connecting line at the destination point where the passenger presented the ticket to such agent, and he returned it without stamping it, telling the purchaser that it was all right.⁹

The Supreme Court of Illinois holds that where a woman, while attempting to alight from a car, was thrown down and injured, by her dress being caught on a projection of the car platform, the fact that the plat-

form was of a pattern in general use on all roads, and approved by railroad men, is not conclusive evidence of freedom from negligence, the projection being plainly visible, and in a position which made the danger of such accidents obvious.¹⁰

The Supreme Court of Maine rules that the holder of a mileage book has no right to dictate to the conductor from what part of the book coupons shall be detached, the determination of that question being for the conductor alone.¹¹

In Texas, on a cold night, plaintiff was a passenger on defendant's train. The car he was in was not properly heated. While it was in rapid motion he attempted to pass from such car to one in front, and when on the platform he slipped and fell to the ground. The Supreme Court holds that it was not error to exclude evidence for plaintiff in regard to the furnace being out of order.¹²

In New York, The Supreme Court decides that it is not negligence *per se* to ride on the side step of a street car where the car is so crowded that the passenger cannot obtain a place inside.¹³

In the Federal Court it is held that a fireman on a locomotive, whose duties are to look after the coal and steaming of the engine, is not bound to observe the distance from the track of all objects along the line of the road, so as to make him chargeable with contributory negligence in failing to remember and avoid such an object when called upon to lean out of the cab in the discharge of a duty outside his usual routine.¹⁴

In Nebraska it is decided that a section man cannot be charged with contributory negligence because he remained upon the track for the purpose of removing an obstruction endangering an approaching train, when he might have saved himself by abandoning the track and leaving the train to its fate.¹⁵

In the Federal Court it is laid down that a court cannot say, as a matter of law, that it is not negligence for a switchman, who might have pulled the coupling pin while the cars were standing still, to wait until they have attained a speed of five miles an hour, and then step in between them, on a dark night, when the ground is frozen and likely to be slippery, with snow upon it, at a point where the tracks interlace, and the ties rise above the level of the roadbed.¹⁶

In Alabama an employee is not guilty of contributory negligence merely because an act of his violates a rule of his employer, he not having knowledge of the rule.¹⁷

- ¹ I. C. v. Matton, N. E. Rep. 1100.
- ² G. H. & S. A. v. Herring, 36 S. W. Rep. 129.
- ³ Wood v. Southern, 24 S. E. 704.
- ⁴ Grand v. Livingston, 38 N. Y. 490.
- ⁵ C. R. I. & T. v. Yarbrough, 35 S. W. Rep. 422.
- ⁶ Funnell v. R. G. W., 44 Pac. Rep. 927.
- ⁷ Kirk v. N. & W. R., 24 S. E. Rep. 639.
- ⁸ Saunders v. S. P., 44 Pac. Rep. 932.
- ⁹ G. C. & S. F. v. St. John, 35 S. W. Rep. 501.
- ¹⁰ Ill. Cent. v. O'Connell, 43 N. E. Rep. 704.
- ¹¹ Eaton v. McIntire, 34 Atl. Rep. 525.
- ¹² Sickles v. M. K. & T., 35 S. W. Rep. 493.
- ¹³ Wood v. B. C., 38 N. Y. 1077.
- ¹⁴ Cent. Trust Co. v. E. T. V. & G., 73 Fed. Rep. 661.
- ¹⁵ O. & R. v. Krayenbuhl, 67 N. W. Rep. 447.
- ¹⁶ L. E. & W. v. Craig, 73 Fed. Rep. 642.
- ¹⁷ Brown v. L. & N., 19 South Rep., 1901.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Augusta & Savannah*, 2½ per cent., payable Jan. 15.
- Georgia Railroad & Banking*, quarterly, 2½ per cent., payable Jan. 15.
- Huntingdon & Broad Top Mountain*, 1 per cent. on common stock and 3½ per cent. on preferred stock, both payable Feb. 8.
- Lake Erie & Western*, 1½ per cent. on preferred stock, payable Feb. 15.
- Nashville, Chattanooga & St. Louis*, quarterly, 2 per cent., payable Feb. 1.
- Portland & Rochester*, 3 per cent., payable Jan. 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Fort Wayne & Jackson*, annual, Jackson, Mich., Jan. 23.
- Los Angeles Terminal*, annual, Los Angeles, Cal., Feb. 11.
- Mobile & Ohio*, annual, Mobile, Ala., Feb. 12.
- Pittsburgh & Lake Erie*, annual, Pittsburgh, Pa., Jan. 25.
- Pittsburgh, McKeesport & Youghiogheny*, annual, Pittsburgh, Pa., Jan. 26.
- Texas Central*, annual, Waco, Tex., Feb. 12.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The *International Association of Car Accountants* will hold a convention at New Orleans, La., on Feb. 23, 1897.
- The *American Railway Association* will hold its convention at Richmond, Va., on April 7, 1897.
- The *National Convention of Railroad Commissioners* will be held at St. Louis, Mo., on May 11, 1897.
- The *International Association of Ticket Agents* will hold a convention at San Antonio, Tex., on March 10, 1897.

The *Association of American Railway Accounting Officers* will hold a convention at Richmond, Va., on May 26, 1897.

The *Association of Railway Claim Agents* will hold its convention at St. Louis, Mo., during the last week of May, 1897.

The *Master Car Builders' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 8, 1897.

The *American Railway Master Mechanics' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 15, 1897.

The *National Association of Local Freight Agents' Associations* will hold a convention at Washington, D. C., on June 8, 1897.

The *Association of Railway Telegraph Superintendents* will hold a convention at Niagara Falls, N. Y., on June 16, 1897.

The *National Association of Car Service Managers* will hold a convention at Boston, Mass., on June 16, 1897.

The *Train Despatchers' Association of America* will hold a convention at Detroit, Mich., on June 22, 1897.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Northwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1123 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building Roanoke, at 6 p. m.

Chicago Electrical Association.

A meeting of the Chicago Electrical Association was held Friday evening, Jan. 15, at Room 1737, Monadnock Block, Chicago. Mr. D. W. C. Tanner read a paper on "Conventional Diagrams of Electrical Apparatus." Mr. Albert Scheible led the discussion which followed. Various news items were presented for discussion by Mr. E. Puchta.

Civil Engineers' Club of Cleveland.

A regular meeting of the Civil Engineers' Club of Cleveland was held in the Case Library Building, on Tuesday evening, Jan. 12. Mr. S. T. Dodd read a paper on "The Applications of the Niagara Falls Power," in which he discussed the plant of the Niagara Falls Power Co., its method of generating power and the various industries in which it is used.

Western Society of Engineers.

The Western Society of Engineers held a "Club Smoker" at the Technical Club, Chicago, Friday evening, Jan. 15. During the evening a stereopticon lantern was presented to the society by the Entertainment Committee of the past year. The lantern is of the "Criterion Electric" pattern as made by J. B. Colt & Co., and cost \$125. It was purchased by funds remaining in the hands of the committee.

The Franklin Institute.

The annual meeting of the Franklin Institute was held on Wednesday of this week at 8 p. m., too late for us to get report of the result of the election. The regular ticket was: For President, John Birkinbine; for Vice-President, W. P. Tatham; for Secretary, William H. Wahl, etc. We suppose that there was no contest. The paper of the evening was by Mr. A. R. Outerbridge, Jr., on "The Advantages of Mechanical Stoking."

Railway Signaling Club.

The annual meeting of the Railway Signaling Club was held at the Great Northern Hotel, Chicago, Jan. 12. A paper by Mr. A. H. Rudd, New York, New Haven & Hartford, on "The Old and New Interlocking Plants at Hartford, Conn.," was read and discussed. The following officers were elected to serve during 1897: President, W. J. Gillingham, Jr., Illinois Central; Vice-President, H. D. Miles, Michigan Central; Secretary and Treasurer, E. M. Seitz, Chicago & Northwestern.

Western Railway Club.

The Western Railway Club held its regular meeting on

Tuesday, Jan. 19, at the Auditorium Hotel, Chicago. The paper presented at the November meeting by Mr. A. M. Waitt, on "Suggestions on Specifications for Construction and Inspection of New Rolling Stock," was discussed. The following topics were also discussed: "Long versus Short Locomotive Runs," and "Water Supply Stations for Locomotives." Mr. E. M. Herr read a paper on "Notes from Work Done on the Chicago & Northwestern Locomotive Testing Plant," and Mr. G. W. Rhodes read a paper on "The Air Brake Has a New Enemy."

Engineers' Club of Philadelphia.

The annual meeting of the Engineers' Club of Philadelphia was held on Saturday evening, Jan. 16, at 1122 Girard street, Philadelphia. The retiring President, Arthur Falkenau, delivered his farewell address, on "The Engineer as a Moral Factor."

The club entertained three Japanese engineers, Mr. Iwaki, Mechanical Superintendent of the Sanyo Railroad in Japan; Mr. Konda, the representative of a steamship line soon to be established between Japan and American and European ports, and Mr. Nakatani, who is studying locomotive building at the Baldwin Locomotive Works. These gentlemen responded to questions asked them about engineering matters in their country. The annual election of officers resulted as follows: President, Joseph T. Richards; Vice-President, Henry Leffmann; Treasurer, George T. Gwilliam; Secretary, L. F. Rondinella; Directors, G. B. Hartley, W. C. L. Elgin, F. Schuman and Gratz Mordecai.

Canadian Society of Civil Engineers.

When the members of the Canadian Society of Civil Engineers met at Montreal, last week, the report of the Council was read, a lively discussion following. The Chairman, Mr. Herbert Wallis, drew attention to the references with regard to the status of members of the profession. At the last session of the Quebec Legislature, a bill which aimed to make the society a close corporation was introduced, but before it could be put through the House was prorogued. He thought that this measure could be made to fit the requirements of the measure if the new council was given authority to push the matter, and it might then once more be presented at Quebec, and also in the legislative assemblies of the other provinces. By the terms of this proposed bill it is intended to prohibit from practice all those who are not incorporate members of the society, or who are entitled to practice by some act of the Dominion or Provincial Parliament, unless such persons who are not at present members shall become members within a term of 12 months. It also provides for the formation of a Board of Examiners, who shall meet every six months to grant certificates to those wishing to be permitted to study, and those who have in due course rendered themselves fit to commence practice. A great deal of discussion followed, many little difficulties being shown. One of these was the question of reciprocity between the recognized professional men of different provinces who might wish to practice in cities or towns outside their own province, and another was the matter of expense. On the motion of Mr. Percival St. George, it was finally resolved that the council be given the necessary authority to act as it might see fit.

The Chairman announced that the Gzowski medal had been awarded to Mr. E. Mohun, M. C. S. C. E., for his paper on "Sewage of Victoria, B. C."

The following are the officers elected for the current year: President, Thomas C. Keefer, C. M. G., Ottawa; Vice-Presidents, Henry T. Bovey, Montreal, William T. Jennings, Toronto, William George Thompson, St. Catharines; Treasurer, Kennet W. Blackwell, Montreal; Secretary, Clement H. McLeod, Montreal.

New York Railroad Club.

At the regular meeting of the New York Railroad Club, held last Thursday night, Mr. George B. Leighton, President of the Los Angeles Terminal Railway, presented a paper on "The Profession of the Railway and a Suggested Course of Training Thereof." This was discussed by a number of the members of the club.

At the same meeting a committee consisting of Mr. James H. Bailey, Mr. R. A. Parke and Mr. George S. Strong presented the following minute and resolutions on the death of Mr. David L. Barnes:

The death of David Leonard Barnes, on Dec. 15 last, has caused more than ordinary sorrow. Few men in the domain of modern railroad engineering have become so widely known or so much admired and respected. Gifted with unusual intelligence and great fertility of mind, and possessed of remarkable energy, he has imprinted his personality upon the locomotive engineering and the car construction of his time.

Through his valuable contributions to the technical press, to the proceedings of this and other railroad clubs, to the deliberations and investigations of the Master Car Builders' and Master Mechanics' Associations, and to the advancement of modern railroad practice, he had at the age of 38 years, achieved such an enviable reputation as is seldom attained through ripe years of experience and professional practice.

It is not alone the work that he individually accomplished which must be assigned to his credit, for he also possessed that enthusiasm and suggestiveness of character which, sometimes by encouragement, sometimes by controversy, inspired and spurred a host of others to persistent investigation and effort which have borne most useful fruit.

The great amount of useful work which, by his tireless industry, he had accomplished at so early an age is not only the most remarkable feature of his career, but it also accentuates the extent of the loss to the engineering profession, of the work of those more mature years, to the threshold of which his experience had but just led him. But beyond the intelligence and aggressiveness which won for him such wide distinction, there was a surpassing charm in his personal qualities, which, to an unusual degree, attracted and attached to him those with whom he came in personal contact.

It is rare that the death of a man so young in professional life has created such a widespread and profound sense of loss; it is equally rare that the death of a man of such high professional attainments brings to so many a keen sense of personal sorrow. Be it, therefore,

Resolved, That this minute be inscribed upon the record and published in the proceedings of this club, as an expression of our high appreciation and esteem for the personal character and valuable labors of David Leonard Barnes and of our deep sense of loss and sorrow in the death of one for whom the future promised so much usefulness and greatness.

Resolved, That the Secretary be instructed to transmit a copy of this minute and resolution to Mrs. Barnes.

PERSONAL.

—Mr. F. A. Johann has become connected with the firm of Shickle Harrison & Howard Iron Co., of St. Louis, as Sales Agent.

—Mr. George Keith, Supervisor of the New England Railroad, died suddenly at the railroad station at Franklin, Mass., on Jan. 19.

—Mr. E. N. Poston, of Logan, O., has been appointed Receiver of the Columbus, Sandusky & Hocking road, operating about 272 miles in Ohio.

—Mr. Lester K. Spafford, Superintendent of bridges and buildings of the Kansas City, Fort Scott & Memphis, died at Phoenix, Ariz., on Jan. 7.

—Mr. H. C. Frick, of the H. C. Frick Coke Co., has been elected President of the Youghiogheny Northern and the Mount Pleasant & Latrobe railroads in Pennsylvania.

—Mr. G. A. Woodman has recently become Superintendent of the Car Department of the Lima Locomotive & Machine Co., Lima, O. He was formerly with the Illinois Central.

—Mr. W. E. Ward, Travelling Freight Agent of the Illinois, Indiana & Iowa Railroad, has been appointed Agent of the Central States Dispatch, in Chicago. The line operates over the Baltimore & Ohio.

—Mr. Fred. A. Kummer, C. E., until recently Southern Representative of the American Wood Preserving Co., of Philadelphia, has been appointed General Representative, with offices at 72 Trinity place, New York City.

—Mr. Eugene S. McCarty, General Manager of the St. Louis, Cape Girardeau & Fort Smith, has resigned his position. Mr. McCarty is Vice-President of the St. Louis, Kennett & Southern, but may join a law firm in St. Louis.

—Mr. George A. Hancock, Superintendent of machinery of the Gulf, Colorado & Santa Fe, will on Feb. 1 assume the position of Assistant Superintendent of machinery of the Atchison, Topeka & Santa Fe with headquarters at Topeka.

—Mr. T. J. Hennessy, the successor, on the Missouri State Board of Railway and Warehouse Commissioners, of Mr. Hickman, assumed the duties of his office on Jan. 12. Mr. Cowgill was re-elected Chairman and James Harding Secretary.

—Mr. S. D. Caldwell, Vice-President and General Manager of the Western Transit Company, the lake line of the New York Central & Hudson River road, has resigned on account of ill health. Mr. Caldwell has been connected with the line for 13 years.

—Mr. William Thornburgh, General Superintendent of the Columbus, Sandusky & Hocking road, has resigned his position, the resignation taking effect Jan. 20. It is reported that Mr. Thornburgh will take the position of Superintendent of the Shelby Tube Works.

—Mr. W. J. Hobbs, General Auditor of the Boston & Maine, has recently been appointed to a similar position on the St. Johnsbury & Lake Champlain road in addition to his present duties. This road is one of the controlled lines of the Boston & Maine, operated separately.

—A new office—that of Chief Industrial Agent—has been created on the Seaboard Air Line. The new officer will devote himself to land development and colonizing along the roads. Mr. John T. Patrick, once Immigration Commissioner of North Carolina, has been appointed to the position.

—Mr. Alfred C. Bedford, assistant to Mr. C. M. Pratt, in the Standard Oil Company and a Director of the Long Island Railroad, was this week elected Treasurer of the Long Island road, to fill the vacancy created by the resignation of Mr. George S. Edgell, who represented the Corbin interests.

—Mr. Charles D. Owens, Vice-President & General Manager of the Atlantic & Danville Railway, died suddenly Friday night, Jan. 15, at Norfolk, Va. Mr. Owens had been for years a prominent transportation man, formerly having been Traffic Agent of the Plant system, with headquarters in New York. He went to Norfolk in 1895.

—Mr. Myron T. Herrick, of Cleveland, and Mr. Robert Blickensderfer, of Toledo, were last week appointed Receivers of the Wheeling & Lake Erie road. Mr. Herrick is a prominent financier of Cleveland who has been identified in many important corporations as a Director and Executive, and Mr. Blickensderfer is the General Superintendent of the Wheeling & Lake Erie.

—Mr. Edson J. Weeks has been appointed General Passenger Agent of the Philadelphia & Reading and will take charge on Feb. 1. Mr. Weeks is now General Agent of the Passenger Department of the New York Central & Hudson River road at Buffalo. He has been in the railroad service for about 20 years. Mr. Weeks succeeds Clinton G. Hancock, who died a few weeks ago.

—Chairman Midgley of the Western Freight Association has been granted a three months' leave of absence by the presidents of the Western roads, and will sail from New York on Feb. 24 for an extended European trip. His trip will be extended to the far East. During his absence C. A. Parker, a member of the board of administration, will act as chairman of the association.

—Mr. S. E. Weir, who has been Engineer of Maintenance of Way over the upper portion of the West Virginia Central & Pittsburgh Railroad, has resigned, and Mr. J. W. Galbreath, formerly Assistant Engineer of Maintenance of Way, has been promoted to succeed him. His headquarters will be at Elkins. Mr. Weir has accepted a position as Manager of the Davis Coal & Coke Co.

—Mr. William Birt, General Manager of the Great Eastern Railway (England), has been knighted and becomes Sir William Birt. He will be 63 years old next May and has been in the service of the Great Eastern since he was 14, a service of 49 years. He has been General Manager 16 years. Under his direction the road has greatly improved in service rendered and in financial position.

—Mr. W. G. Brown has been appointed Auditor of Disbursements of the Philadelphia & Reading Coal & Iron Co., to fill the vacancy caused by the death of W. J. Hurst. Mr. Brown has been with the Reading Railroad Co. for about 27 years. During the second receivership President Gowen appointed Mr. Brown Comptroller of the company and he was later appointed Assistant Secretary by President McLeod, which position he has held up to the present time.

—Mr. Quinette de Rochemont has been appointed Director of Navigation and Mines in the Ministry of Public Works, France. He is a little more than 58 years old, and has been a distinguished man from his

entrance into active work. He graduated first in his class from the Ponts et Chaussées, was decorated with the Legion of Honor in 1871, and is one of the highest authorities in harbor works. He was Chief Engineer of the port of Havre for 11 years, and has lectured on maritime works at the Ponts et Chaussées the last five years.

—Mr. Stephen Little has been engaged by the syndicate that acquired the holdings of the Austin Corbin estate in the Long Island Railroad to examine the company's accounts. Mr. H. H. Vreeland, President of the Metropolitan Traction Co., of New York, has recently been engaged in examining the physical condition of the road, with which he is especially familiar, having formerly been with the company for many years. The reports of Mr. Vreeland and Mr. Little have been made for the syndicate which has recently purchased the Corbin interest in the property.

ELECTIONS AND APPOINTMENTS.

Bellefonte & Clearfield.—These officers were elected in Bellefonte, Pa., last week: President, Charles W. Willhelm; Vice-President, James Harris; Secretary, L. T. Munson, and Treasurer, Wilfred Hebler. The road was organized a year ago.

Bloomsburg & Sullivan.—At the annual meeting, Jan. 11, in Bloomsburg, Pa., the following were elected for the ensuing year: President, C. R. Hucklew; Directors, M. McMichael, Charles Evans, F. W. Clark, Jr., H. H. Pigott, J. K. Grotz, L. E. Waller, Samuel Wigfall and H. J. Conner. The Board elected Samuel Wigfall, Treasurer, and H. J. Conner, Secretary. F. M. Leader was reappointed General Manager.

Central of Georgia.—The stockholders, at a meeting held at Savannah last week, ratified the amendment to the charter permitting the election of 15 instead of 13 directors, having been fixed by Secretary of State, etc., was adopted, and President Spencer of the Southern, and O. R. Lawton, Jr., were elected as the two additional directors.

Chicago, Paducah & Memphis.—The annual meeting of the company was held at East St. Louis on Jan. 13. There were no changes in the board of officers for the ensuing year except in the presidency, B. F. Johnston, of St. Elmo, succeeding W. L. Huse, who resigned on account of a contemplated trip abroad.

Cornwall & Lebanon.—At a meeting of the Directors, Jan. 12, Henry W. Siegrist was elected Treasurer to succeed ex-Treasurer Allen D. Hoffer, and he will assume the new duties at once.

Erie & Pittsburgh.—At a stockholders' meeting, held in Erie, on Jan. 16, the following directors were elected: Charles H. Strong, Matthew H. Taylor and William Brewster, Erie; John J. Spearman, Sharpsville, Pa.; James McCrea, Pittsburgh, and Charles J. Fairchild, New York. Charles H. Strong was elected President and William Brewster Secretary and Treasurer.

Lehigh Valley.—At the annual meeting of the company these directors were elected: Elisha P. Wilbur, Charles Hartschorn, William L. Convgban, William A. Ingham, Robert H. Savre, James J. Blakslee, John B. Garrett, Charles O. Skeer, Beauveau Borie, Joseph Wharton, Thomas McKean, Greiger Myers and Eugene Delano.

Long Island.—A. C. Bedford has been elected Treasurer, succeeding George S. Edgell, resigned. The New York office of the company is to be removed as soon as practicable to the Standard Oil Building, 29 Broadway, New York.

Mexican Central.—F. T. Dolan has been appointed Superintendent of the Chihuahua Division with headquarters at Ciudad Juarez, Mex., vice R. E. Comfort, assigned to other duties.

Missouri, Kansas & Texas.—Effective Feb. 1, Frank Drew has been appointed Freight & Passenger Agent for this road in Kansas and Indian Territory, with headquarters at Parsons, Kan.

Norwich & Worcester.—The annual meeting of company was held in Worcester, Mass. The old Board of Directors, consisting of Edward L. Davis, Thomas B. Eaton, Josiah H. Clarke, Francis H. Dewey, A. George Bullock and Stephen Salisbury, all of Worcester; Charles P. Cogswell, of Norwich, Conn., and Edward C. Thayer, of Keene, N. H., were unanimously re-elected. A. G. Bullock was re-elected President, and M. M. Whittemore, of Norwich, Treasurer.

Oconee & Western.—At the annual meeting of the road held at Empire, Ga., on Jan. 12, the following Directors were elected: I. C. Kiggins, Fred De Coppel, of New York; Robt. H. England, Rochester, N. Y.; H. A. Clare, New York; E. J. Henry, W. C. Parsons, Hawkinsville, Ga., and J. W. Hightower, Empire, Ga. The following officers were elected: H. A. Clare, President, New York; J. W. Hightower, Empire, Ga.; Robt. H. England, General Manager, Dublin, Ga.; E. H. Rogers, Treasurer, New York; W. C. Herrmann, Secretary, New York; M. V. Mahoney, General Freight and Passenger Agent, Hawkinsville, Ga.

Pittsburgh, Bessemer & Lake Erie.—Articles of consolidation and merger of the Butler & Pittsburgh, and Pittsburgh, Shenango & Lake Erie companies under this title has been formally recorded in Pennsylvania. Samuel B. Dick is Chairman of the Board of Directors. The officers are James H. Reed, President; Jabez T. Odell, Vice President; Thomas H. Given, Treasurer, and A. Franks, Secretary.

Pittsburgh, Cornellsville & Wheeling.—The Directors of this newly organized company are: Alexander P. Funk, President; Howard C. Bolton, Benjamin Erick, W. C. Richey, New York; W. E. Vanderventer, Clinton, N. J.; C. A. Smith, Easton, Pa.; H. A. Douglass, West Newton, Pa.; G. H. Murdoch, Jefferson, Pa.; T. D. Wisecarver, Waynesburg, Pa.; J. S. Douglass, Uniontown, Pa.; J. F. Peirsol, Wilkinsburg; R. L. Martin, John Hlythe, Pittsburgh, Jonathan Barrett is Chief Engineer.

Portland & Ogdensburg.—The company at its annual meeting Jan. 19 elected the following, directors: Samuel J. Anderson, Portland; Charles H. Anderson, Penacook, N. H.; James P. Baxter, John Deering, James F. Hawkes, T. A. Josselyn, Weston F. Milliken, Thomas P. Shaw, Elias Thomas and Edward B. Winslow.

Potomac Short Line.—T. H. B. Dawson, of Berkeley Springs, W. Va., has been elected President; Lewis Sar gent, of Paw Paw, W. Va., Treasurer, and P. E. Dawson, of Hancock, Md., Secretary. The company is a new one in West Virginia.

Sabine & East Texas.—At a meeting of the stockhold-

ers, held recently in Beaumont, Tex., the following directors were re-elected: W. G. Van Vleet, C. W. Bein, C. B. Seger, T. W. House, W. B. Mulvey, W. M. Mahl and John B. Goodline. The officers are: W. G. Van Vleet, President; John B. Goodline, Vice-President, Secretary and Treasurer, and I. E. Gates, Assistant Secretary and Treasurer. The road is one of the Southern Pacific lines in Texas.

St. Johnsbury & Lake Champlain.—Myron Taylor having resigned as Auditor of this Company, Mr. William J. Hobbs has been appointed General Auditor, with office at Boston. Mr. William H. Young has been appointed Auditor of Passenger Accounts and Mr. William H. Allen Auditor of Freight Accounts, with offices at Boston, Mass.

St. Louis & San Francisco.—M. Schuller, formerly Chief Clerk, has been appointed General Agent of the company at Chicago, succeeding J. H. Cook, resigned.

Seaboard Air Line.—John T. Patrick has been appointed Chief Industrial Agent of the railroads comprising the Seaboard Air Line. Vice-President St. John's circular announcement says: "Mr. Patrick will, in such capacity, have charge of, and in every way possible encourage and aid in the settlement of lands, on the railroads comprising this system, the securing of new industries, etc. Representatives of this company, and all wishing information in regard to lands, or desirable locations for settlement, should address the Chief Industrial Agent at Portsmouth, Va., or at Pinebluff, N. C., at either of which points he will have offices."

The title of George L. Rhodes is General Agent, with headquarters in Washington, D. C., instead of District Passenger Agent, as stated last week.

Terre Haute & Indianapolis.—At a stockholders' meeting, held Jan. 13, directors were elected as follows: James McCrea, J. T. Brooks, John E. Davidson, James J. Turner, W. R. McKean, D. W. Marshall and Herman Hulman. All of the old officers were re-elected as follows: President, James McCrea; Vice-President, J. J. Turner; Secretary, George E. Farrington; Treasurer, R. B. Thompson; Assistant Secretary, W. G. Phelps. All of the old officers were reappointed. The road is now operated by a Receiver.

Terre Haute & Logansport.—The following directors and officers were recently elected: Directors, James McCrea, John E. Davidson, J. J. Turner, W. R. McKean, George E. Farrington; President, James McCrea; Vice-President, J. J. Turner; Treasurer, R. B. Thompson; Secretary, George E. Farrington.

Union Pacific.—Charles J. Lane, formerly Division Freight Agent, has been made Assistant General Freight Agent, with headquarters in Omaha, Neb.

Virginia, Fredericksburg & Western.—The annual meeting at Fredericksburg, Va., was held on Jan. 15. The Board of Directors elected are: Charles H. Gibson, William A. Little, Jr., John V. Giles, William A. Jones, F. L. Rodgers, William C. Haight, Elmore D. Alvord, Lloyd T. Smith, Edwin B. Alvord and S. H. Leszynsky. The directors elected United States Senator Charles H. Gibson President, with John V. Giles, of Bridgeport, Conn., Vice-President and E. D. Alvord, Secretary.

Western New York & Pennsylvania.—At the annual meeting of the stockholders of the Western New York & Pennsylvania, held in Philadelphia on Jan. 11, the old Board of Directors was re-elected as follows: Samuel G. DeCoursey, Nicholas Thouron, George E. Bartol, Charles M. Lea, J. R. Rundle Smith, William C. Bullitt, E. W. Clark, Jr., E. L. Owen, P. P. Pratt, Isaac N. Seligman, Rudolph Flinsch, Frank G. Rogers, Charles A. Brinley.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Alabama Midland.—The Plant Investment Co. has surveyors in the field locating a line for a branch from a point near Newton, in Dale County, Ala., beginning on the Choctawhatchee River, straight on to Elba, in Coffee County, a distance of 35 miles, going through agricultural and timber counties in Alabama.

British Pacific.—The projectors will apply to Parliament at its coming session for incorporation. The company proposes to build a road from Victoria, B. C., through the Northwest Territories, to Winnipeg, Manitoba, with a branch to Hudson Bay.

Chicago, Hammond & Western.—This new belt line at Chicago was formally inspected by many Chicago freight shippers on Saturday last. The company will open its new line through the stock yards this week, and its extension from La Grange (the Chicago, Milwaukee & St. Paul connection) is being pushed to rapid completion. The new belt line is already handling from 125 to 150 loads of freight daily, and has just received some heavy locomotives from the Schenectady Locomotive Works.

Columbian & Western.—This new company in British Columbia is the market for 22 miles of rails and fastenings, the weight of the rails to be between 45 and 60 lbs. per yard. F. P. Gutelius, of Trail, B. C., is General Superintendent.

Cowen & Birch River.—Secretary of State Chilton, of West Virginia, on Jan. 13 issued a certificate of incorporation to this company to N. B. McCarthy and others, of Buckhannon, W. Va. The road will be built to develop timber and coal lands in Upshur and Webster Counties, W. Va., and will be a feeder for the West Virginia & Pittsburgh. The capital stock is \$1,000,000. The projectors are interested in the development of the territory through which the road is to pass.

Detroit & Mackinac.—It is reported that the company has about decided to build a track from Tawas, Mich., to the plaster beds at Alabaster, five miles.

Duluth & Southwestern.—The promoters of this road have secured the endorsement of their petition for monetary aid from St. Louis County in the sum of \$250,000, by a large majority, of the Trades Assembly in Duluth, at a meeting on Jan. 8.

Erie.—The company is receiving proposals for second tracking its Greenwood Lake Division, formerly the New York & Greenwood Lake Railway, from a point on the Hackensack Meadows where it leaves the Newark Branch just beyond the Hackensack River, northwest to Little Falls, N. J., a distance of 14.96 miles. For several months work has been in progress on a new double track bridge over the Passaic River between North Newark and West Arlington, preparatory to this new second tracking.

Gray's Point Terminal.—A special meeting of the stockholders will be held in the company's office in the Equitable Building, St. Louis, on Feb. 24 to vote upon

the proposed issue of bonds amounting to \$500,000, to complete and equip its road between Delta, 15 miles, easterly to Gray's Point, Mo., on the Mississippi River. S. W. Fordyce is President of the company and S. C. Johnson is Secretary. The line will give new facilities to the St. Louis Southwestern at Cape Girardeau, the company at present using the terminals of the Cape Girardeau Southwestern.

Kansas City, Pittsburgh & Gulf.—Tracklaying was begun at Horatio, Ark., on Jan. 1, and is now being pushed between Mena and Horatio from both ends of the gap. There remains but 44 miles uncompleted of the line to Shreveport.

Midland Terminal.—Local papers state that this road has secured the right of way from the present station in Cripple, Col., a mile up Poverty Gulch, and thence around the base of Tenderfoot Hill. The importance of this track is due to the tapping of the rich mines in Poverty Gulch, and improving the means of shipment from the big producers on Gold Hill and Globe Hill.

New Roads.—The Board of Trade of Little Rock, Ark., has been passing resolutions looking to the building of a road westerly from Little Rock, via Hot Springs, to the western part of the State, connecting with the Kansas City, Pittsburgh & Gulf, at Mena, Ark., or some other point. The members of the Board of Trade think it would be an easy matter to construct such a line if the state allowed the use of its convicts on the work. They propose to attempt to secure such authority. The present activity in this project is a recent matter, and nothing more than has been outlined above has been accomplished.

Messrs. Duncan and Lord, who are interested with Waco (Tex.) capitalists in the coal and clay deposits at Headsville, Tex., 45 miles from Waco, have secured right of way for their proposed road from the coal deposits to Waco, and it is proposed to complete a survey at an early date. The line will run from Waco, passing near Mart, thence southeast to Beaumont, reaching the coal at Thornton; thence through Madisonville and Huntsville to Beaumont on the Southern Pacific.

Norwich & Worcester.—The stockholders have formally voted to authorize the directors to extend the line from Allyn's Point, Conn., its present terminus, about seven miles south of Norwich, to Groton, Conn., a distance of six miles. The cost of the work is to be met by an issue of additional bonds or of new stock for \$500,000. This branch has been long talked of. It will give the New England, which leases the Norwich & Worcester, a line almost to New London, independent of the New London Northern (Central Vermont), which is now used to reach New London. With the building of the new line, the company's trains, instead of being sent over the New London Northern line on the west side of the river from Norwich to connect with the boats to New York, can go over the new line on the east side to Groton, where connection will be made with the New York, New Haven & Hartford, and that line used into the New London station.

Ohio River & Charleston.—It is proposed to build a branch of this road, which is controlled by the Finance and Investment Company of Philadelphia from Blacksburg, to Gaffney, S. C. Samuel Hunt, of Cincinnati, is President and General Manager. The road was formerly known as the Charleston, Cincinnati & Chicago, and is now operated in three sections, which are not connected. The building of the road to Gaffney will make available valuable water powers on the Broad River near Blacksburg, the development of which has been delayed because of the absence of transportation facilities, and the extension will connect the Cherokee Falls Cotton Mills and those at Gaffney with the main line of the road, thus giving it considerable new traffic.

There will be an issue of \$600,000 bonds on the road in North and South Carolina for the purpose of building certain branches and making extensions.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Contractor C. A. Casparis, of Columbus, O., who is making the fill on the Pan Handle division, at Steubenville, O., says that he will complete the work this week. The fill is to repair a washout caused by the flood of last July. The fill was more than 60 ft. deep. A bridge which went out at the same time will be rebuilt as soon as the fill is completed.

Pittsburg, Fort Wayne & Chicago.—The company has in contemplation important improvements in the roadbed. It is the intention to grade the roadbed so that the grade will be no greater than 20 ft. per mile. Buck Hill, near Canton, O., has been surveyed and will be one of the first grades reduced to conform to the new plan. We are not advised as to the grade between Wooster and Orville, O. In places where the grade cannot be reduced, the tracks will be taken up and transferred to a more favorable route.—Exchange.

South Side Elevated (Chicago).—Articles of incorporation of this company, which succeeds the old Alley Elevated Company, known as the Chicago & South Side Rapid Transit, were filed in the office of the Secretary of State, at Springfield, Ill., Jan. 14. The capital stock is \$10,323,800. The first Directors are Byron L. Smith, William B. Walker, A. O. Slaughter, Joseph Leister, L. J. Gage, Geo. E. Adams, C. J. Blair, Edwin L. Lobdell, T. J. Lefens, Ebenezer Buckingham, William Fleming and Leslie Carter.

Virginia, Fredericksburg & Western.—At the recent stockholders' meeting at Fredericksburg, Va., W. McD. Lee, one of the officers, stated that he had obtained 75 per cent. of the entire right of way along the route through the Northern Neck of Virginia without compensation or claims for any. The company expects that plans will soon be consummated for beginning work at an early date.

Wilkes-Barre & Northern.—The contractor Robert Mitchell, of Plainville, has about 100 men at work at present building the road from Dallas, Pa., and the men are already at a point two miles beyond Dallas. It is thought that the road will be opened to Harvey's Lake by July 4.

Electric Railroad Construction.

Addison, N. Y.—Money has been subscribed for a survey for an electric road between Jasper, Woodhull and Addison, G. H. Brewster, John Hinman, D. M. Darian and others are interested.

Atlanta, Ga.—The Exposition Park Co., organized a short time ago with a capital of \$20,000, propose to establish a new park near Atlanta, which will involve the construction of a new road. The Atlanta Consolidated Street Railway Co. has agreed to extend its Fourteenth street line through the park, entering

the northern entrance at Fourteenth street, passing around the northern side of the racetrack and crossing the dam along the east side of Clare Mere, leaving the grounds at the Jackson street entrance and connecting with the old nine-mile circuit at the Consolidated power-house which will involve the building of several miles of electric road.

Auburn, N. Y.—G. B. Leonard, W. P. Goodelle, W. A. Holden, H. W. Plumb and C. D. Beebe, all of Syracuse, are the incorporators of the new Auburn & Western Railway Co., which proposes to build an electric road to Seneca Falls.

Brooklyn.—Bids will be opened at the Queens County Board of Supervisors on Jan. 26 for an electric road to be built from Jamaica to Hempstead, over the line of the Jamaica and Hempstead plank road.

Carlisle, Pa.—The Town Council has repealed the ordinance granted about two years ago to the Cumberland Valley Passenger Electric Railway Co. to lay its tracks and operate an electric road in Carlisle.

Elyria, O.—A franchise has been granted to the Cleveland, Berea & Elyria Electric Railroad to extend its line through Elyria to Oberlin.

Fort Erie, Ont.—The Fort Erie & Bridgeburg Street Railway Co., Ltd., is applying for a charter to build an electric road in Fort Erie and Bridgeburg, Ont. Capital, \$50,000.

Grafton, W. Va.—The County Commissioners of Taylor County, W. Va., last week granted to Theodore L. Swan, C. L. Brown and T. H. Wilson, of New York City, the right to build an electric road along the county road between Grafton and Pruntytown, a distance of seven miles. The work must be begun within six months and be completed within two years. The road will carry express, mail and light freight. The road passes through a thickly settled district.

Middletown, Md.—A preliminary survey has been made between Middletown and Myersville, a distance of four miles, in order to ascertain the cost of extending the Frederick-Middletown Electric Railroad to Myersville.

Mt. Holly Springs, Pa.—The Cumberland Valley Traction Co. is under contract to build the extension from Boiling Springs to Mt. Holly Springs by May 1, 1897, and to complete the line by Aug. 1, 1897.

New Britain, Conn.—If the Central Railway & Electric Co. secures legislation favorable to the extension of its line from New Britain to Hartford, work will be begun April 1 and finished by June 1. Extra boilers for the operation of the line have been placed in the local power-house, and cars to be used on the line are awaiting orders for shipment. The rails and poles are already along the route to Hartford.

New Castle, Pa.—The New Castle Traction Co. was incorporated at Harrisburg Jan. 12, with a capital stock of \$500,000. The Directors are: E. L. Allen, Allegheny; W. L. Mervin and H. W. Mitchell, of Pittsburgh.

New Paltz, N. Y.—The New Paltz & Walkkill Valley Railroad has been incorporated to build a surface electric road, nine miles long, from the Poughkeepsie Ferry at Highland, N. Y., along the New Paltz turnpike to the Walkkill River at New Paltz Ulster County. Capital, \$150,000. Directors: Hugh H. Douglass and G. Howard Harman, of Boston; Paul Shaffer, Charles G. M. Thomas, James F. Reid, of New York, and others. The principal office of the company will be at 71 Broadway, New York.

Pittsburgh, Pa.—A charter has been granted to the Citizens' Monongahela Street Railway Co., to build a line four miles long. The road will cross the Monongahela by way of the Smithfield street bridge.

The Citizens' Monongahela Street Railway Co. has been incorporated to build a line four miles long from Mt. Washington to the Union depot. An ordinance was also presented in Select Council by John Paul to give the company a right of way. W. C. Jutte, the contractor, has a charter for a line over a similar route, and the West End Traction Co. has plans for an extension to the western end of the hilltop. The incorporators of the new road are the owners of the Monongahela Incline Co. James M. Bailey is president, John Paul, Joseph G. Walter, William Halpin, William H. Minnick and Mr. Bailey are directors. The nominal capital is \$24,000, but \$200,000 will be required to construct and equip the line. The line only goes to the top of Boggs avenue on the south. Cars will be run down on the Monongahela wagon incline and across the Birmingham bridge to Water and Smithfield streets.

Rockville, Conn.—We learn from the Hartford Times that the Rockville & Elington Street Railway Co. has abandoned the plan to build an electric road in Rockville and to extend the same from Rockville to Talcottville. As stated in these notes Nov. 6, the city required \$1,000 to be paid yearly for the grant of the franchise for the road in the city limits. It appears that the street railroad has abandoned the plan because of this stipulation. The Hartford, Manchester & Rockville Company has been granted the right to build a continuation of its present road from Talcottville to Rockville and will now apply for rights from the latter village, with a view to building the road this spring.

St. Louis.—The residents of the southwestern suburbs will very soon petition the Union Depot Railroad Co. for an extension of the present Cherokee street line to the city limits.

Schuylkill Haven, Pa.—Town Council has granted a franchise to the Pottsville & Reading Electric Railway Co., which proposes to build a line to connect Pottsville with Schuylkill Haven.

Springfield, Mass.—The Springfield & Southwestern Railway Co., previously referred to in these notes, has applied for incorporation in Connecticut. The application specifies a line from the State Line, through Suffield to Granby and to Rainbow. The question of a bridge across the Connecticut River and the right of way within the city of Springfield has not been decided upon as yet.

Syracuse, N. Y.—The Syracuse Rapid Transit Co. has prepared plans for the coming year covering improvements to cost nearly \$400,000. The light rails on many of the lines will be replaced by heavy ones, and the lines on Grace and West Genesee streets will be extended. A new power-house is being built on Tracy street in the Third Ward under the direction of H. S. Newton, Electrical Engineer of the road.

Titusville, Pa.—Jan. 12, the Titusville Electric Traction Co. was chartered at Harrisburg with a capital of \$100,000 and the following directors: M. B. Dunham, of Warren, President; A. J. Hazeltine, R. D. Stoeltzing, T.

F. Lemassena, G. H. Dunham. The line will be 15 miles long, taking in the towns of Titusville, Pleasantville, Hydettown, East Titusville and Enterprise. Tracks will be laid over the principal streets in this city.

Torrington, Conn.—Erastus Gay and A. R. Wadsworth, of Farmington; J. A. Reeve and L. L. Lowrey, of Burlington; L. Cathin and A. G. Wilson, of Harwinton, and D. W. Clark, of Torrington, are among the incorporators of the electric road to run from Torrington to Harwinton.

Wheeling, W. Va.—It is reported that plans are about completed for extending the Wheeling & Suburban Railway from Triadelphia, along the National pike, to West Alexander, Pa., and that a movement has been set on foot by Wheeling and Washington, Pa., capitalists for extending the line from West Alexander to Washington. Work on the extension to West Alexander will begin as soon as spring opens.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—Judge Foster, of the United States Circuit Court in Arkansas, has decided in favor of the defendant in the application of the Atchison, Topeka & Santa Fe Railroad Co. to dismiss the suit of Dwight Braman against the railroad company. The decision is merely technical and the general counsel of the new Atchison Company states it does not affect the new company. Mr. Braman has a suit pending against the St. Louis & San Francisco Receivers and the Receivers of the old Atchison in which he seeks to have the issue of four per cent. consolidated mortgage bond of the St. Louis & San Francisco Railway Co. set aside as fraudulent. The case will now proceed to trial on the merits of the question involved.

Atlantic & Pacific.—The foreign bondholders' committees have voted to accept the offer of the Atchison to purchase the first-mortgage six per cent. Western Division bonds, and a meeting of the New York committee has been called for Jan. 23 to vote upon the proposition. It is expected that the American bondholders will ratify the action of the foreign bondholders, the New York committee recommending the sale. The terms under which the Atchison acquires the Western Division are that the Atchison is to give 52½ per cent. in Atchison general mortgage four per cent. bonds, amounting to \$8,400,000, and 57½ per cent. in Atchison preferred stock, amounting to \$9,200,000, for the \$16,000,000 Atlantic & Pacific first-mortgage bonds covering the Western Division. In case the sale is carried through, Atchison will be in a position to complete the pending foreclosure and buy in the road when the sale is made. An allowance of \$500,000 is provided for foreclosure and reorganization expenses, and the purchasers will acquire the property subject only to such charges as may exist against the receivership. The Atchison is to be released from all liability upon the guaranteed trust four per cent. bonds of the Atlantic & Pacific, and the pending suits are to be discontinued or assigned. This will enable the Atchison to issue its common stock, which has been delayed by reason of action taken by the Atlantic & Pacific bondholders. The Atchison directors will hold a meeting to approve the settlement and authorize the appropriation of securities in payment for the Atlantic & Pacific bonds from the securities reserved for that purpose in the Atchison plan of reorganization. The Atlantic & Pacific committees will retain possession and control of the first-mortgage bonds of the Central Division, amounting to \$2,794,000. No date has yet been fixed upon for the sale of the Western Division and the matter will now be subject to the wishes of the Atchison people. The Western Division commences at Isleta Junction, N. Mex. (about 12 miles South of Albuquerque), the western terminus of the Atchison, and extends to The Needles, Cal., about 565 miles. The line west of The Needles is known as the Mojave Division, is leased from the Southern Pacific and extends to Mojave, Cal. The Central division extends from Seneca, Mo., to Sapulpa, Ind. T., about 112 miles, and is at present operated by the St. Louis & San Francisco. Provision is made for the retention of sufficient equipment by the Atlantic & Pacific to operate this division in case no sale of it is made to another company. The Atchison has no use for it, as it does not connect with its line at either end and the probabilities are that it will eventually pass into the control of the St. Louis & San Francisco. A circular has been issued by T. W. Lillie announcing the formation of a protective committee of the junior Atlantic & Pacific security holders and calling for the deposit of securities. It is not apparent what advantage such a committee can be to these security holders unless they are prepared to purchase the road at the sale.

Chattanooga, Rome & Columbus.—This road was sold at Rome, Ga., on Jan. 13, by order of the United States Circuit Court. The road was bought by Simon Borg & Co., of New York, for the bondholders. The price paid was \$500,000. The road extends from Chattanooga to Carrollton, Ga., and is 150 miles in length.

Chicago & South Side Rapid Transit.—Articles of incorporation of the successor company to take over this road were filed in Chicago last week, under the name of the South Side Elevator Railroad Company. The capital stock of the new corporation is \$10,323,800. The incorporators are Charles E. Soule, Jr., Frederick T. Clatworthy, William A. Rawson, Frank N. Hillis and Clare H. Whitney.

Columbus, Sandusky & Hocking.—Judge Wright, of the Ohio State Court, has appointed E. M. Poston, of Nelsonville, Receiver of the company. Judge Wright said, in making the order, that the petition for a receivership seemed fully warranted by the large indebtedness of the company. The company owns 227 miles of road south from Sandusky, O., on Lake Erie.

Erie.—The company announces that it has made an arrangement with J. P. Morgan & Co. to extend for 50 years, at four per cent. per annum, the first mortgage bonds issued by the New York & Erie Railroad Company, maturing May 1 next.

Fitchburg.—The Massachusetts Railroad Commissioners will give a hearing on Jan. 25, on the petition of the company for authority to issue \$2,750,000 new bonds for the purpose of taking up bonds that mature this year.

North Carolina.—The contest over continuing the lease of this 300-mile road from Goldsboro via Raleigh and Greensboro, to Charlotte, and owned principally by the state of North Carolina to the Southern Railway Company, renewed 15 months ago, is now on at Raleigh. The new rental is seven per cent. on a capital stock of \$4,000,000, of which \$3,000,000 is owned by the state and \$1,000,000 by private stockholders, the latter being well pleased with the transaction. Governor

Russell, the new Republican Governor, in his inaugural address last week, urged an annulling of the lease, made by his Democratic predecessor and the directors on the part of the state, acting with the directors elected by the private stockholders. Lawyers state that they are unable to see how the lease can be annulled even in the state courts. The agitation of the question, however, will probably delay the betterments and extensions which the Southern had decided to make the double tracking between Greensboro and Charlotte, 100 miles, and other work. The Southern, however, has already spent over \$100,000 in betterments since the new lease was secured in August last.

Norwich & Worcester.—At the stockholders' meeting last week an issue of 30 year four per cent. bonds to the amount of \$400,000 was voted to replace the same amount of 20-year bonds expiring March 1.

St. Clair, Madison & St. Louis.—J. F. Barnard was appointed Receiver on Jan. 15. The property over which the receivership extends consists of the Alton bridge and its approaches, the double track across the river as far as West Alton, and the tracks upon the Illinois side of the river. When the road was begun it was the intention to build a belt railroad from St. Louis around through St. Charles and Madison counties, and from Alton to St. Louis. The line from Alton to St. Louis was built, but after the completion of the Alton bridge the depression in the money market prevented the company from securing further loans with which to complete the belt line.

Saranac & Lake Placid.—This road has been leased to the Chateaugay Railroad Company and the Chateaugay Ore & Iron Co. jointly for a period of 17 years. The lessees agree to pay as rental 35 per cent. of the gross receipts of the Saranac & Lake Placid, and one-half of the net profit arising from the operation of the transfer business at Lake Placid, which shall amount to at least \$7,200. This will cover the interest on the Saranac & Lake Placid bonds, which are reduced from a 6 per cent. to a 5 per cent. bond. This road is 15 miles long, between Saranac and Lake Placid, N. Y., in the eastern part of the Adirondacks, and was built a few years ago.

Seaboard & Roanoke.—The contest for control of the Seaboard Air Line has been reopened in Baltimore by a replevin suit brought by Thomas F. Ryan to recover 153 shares of Seaboard & Roanoke stock, for which he held a certificate issued by the Chairman of the Pooling Committee to Theodore Cook. Mr. Ryan began his suit after a refusal by the manager of the pool to deliver the stock for which the certificate is a receipt.

Toledo & Ohio Central.—The company has passed the dividend on the preferred stock, due next month. The dividend for the previous quarter, due in November, was never declared. At present the company is earning little more than its fixed charges, and no material improvement in earnings is expected until something is done to remove the present demoralization in soft coal. This is the second dividend the company has passed since it began payments upon its preferred stock in 1890.

Union Pacific.—Earnings for November and 11 months of the fiscal year were:

	1896	1895	Inc. or dec.
Gross earn.....	\$2,171,183	\$2,127,093	I. \$44,089
Oper. exp. (exclud. taxes)...	1,339,283	1,223,686	I. 115,596
Net earn.....	\$831,900	\$903,407	D. \$71,507

	1896	1895	Inc. or dec.
Gross earn.....	\$20,562,642	\$20,411,753	I. \$550,889
Oper. exp. (exclud. taxes)...	13,296,639	12,752,126	I. 544,513
Net earn.....	\$7,266,003	\$7,659,626	I. \$6,378

UNION PACIFIC PROPER.

	1896	1895	Inc. or dec.
Gross earn.....	\$1,363,337	\$1,362,813	I. \$523
Oper. exp. (exclud. taxes)...	847,351	800,596	I. 46,755
Net earn.....	\$515,985	\$562,217	D. \$46,261

	1896	1895	Inc. or dec.
Gross earn.....	\$13,206,698	\$13,193,859	I. \$12,838
Oper. exp. (exclud. taxes)...	8,250,897	8,062,647	I. 188,249
Net earn.....	\$4,955,800	\$5,131,211	D. \$175,410

OREGON SHORT LINE & UTAH NOR.

	1896	1895	Inc. or dec.
Gross earn.....	\$326,477	\$509,749	I. \$25,728
Oper. exp. (exclud. taxes)...	263,496	235,249	I. 28,246
Net earn.....	\$62,980	\$265,499	D. \$2,518

	1896	1895	Inc. or dec.
Gross earn.....	\$5,105,982	\$4,923,120	I. \$182,861
Oper. exp. (exclud. taxes)...	2,869,330	2,740,861	I. 128,469
Net earn.....	\$2,235,952	\$2,182,259	I. 53,692

Wheeling & Lake Erie.—Louis Fitzgerald, W. L. Bull and Duncan D. Parmlly, of New York, are acting as a committee of the first mortgage five per cent., consolidated mortgage four per cent. bondholders and owners of preferred and common stock to protect the interests of all holders, and to prepare a plan of reorganization when needed.

Electric Railroad News.

Bradford, Pa.—The capital stock, \$100,000, has been subscribed, and if \$150,000 in bonds can be sold, the proposed Olean, Bradford & Rock City Railroad will be built. If the bonds cannot be sold the project will probably be dropped.

Brooklyn, N. Y.—The new Brooklyn ordinance compelling the electric cars to be stopped on the far corners of streets and the front platforms and doors to be kept closed, went into operation on Wednesday of last week.

Cleveland, O.—J. B. Hanna, George Mulhern and S. T. Everett have been elected directors of the Cleveland City Railroad Co., to fill the places of Frank Robison, Charles Hathaway and J. J. Shipperd. Mr. C. F. Emery has been elected to fill the office of Vice-President, formerly held by Mr. Robison, who refuses to state why the changes among the directors have been made.

Hamilton, Ont.—The International Radial Railway Co. will apply for a bonus of \$65,000 toward the construction of an electric road from Hamilton to Guelph.

New Haven, Conn.—The Fair Haven & Waterville Street Railroad Co., of New Haven, has increased its capital from \$600,000 to \$900,000. The proceeds of the new stock will be used to pay for the New Haven and Centerville road, recently purchased. The stockholders will take the new stock at par.

Owensboro, Ky.—On Jan. 5, the car sheds and supply-house of the Owensboro Electric Railway were de-

stroyed by fire. The loss is estimated at \$8,000; insurance, \$3,000.

Racine, Wis.—On Jan. 16, Hiram J. Smith was appointed Receiver of the Belle City Railway Co. on application of the Sterling Co., of Chicago, which held a judgment for \$3,000 against the street railroad, which is said to have cost about \$400,000 and is bonded for \$300,000.

Raleigh, N. C.—The car cars and engine-house of the Raleigh Electric Co. were burned Dec. 31, and 9 cars, 5 dynamos and 4 engines of 125 H. P. each were either partially or totally destroyed. Total estimated loss, \$50,000. The insurance is said to be \$12,000.

Steelton, Pa.—Directors of the Middletown, Highspire & Steelton Electric Railway Co. have been elected as follows: G. W. Cumler, President, and E. C. Felton, John Q. Denney, S. Zimmerman, J. E. Rutherford and S. Cameron Young, directors.

TRAFFIC.

Traffic Notes.

A freight bureau has been organized by the merchants of San Antonio, Tex.

The Soo Line announces a reduction in freight rates from the East, the first class rate from New York and Boston to St. Paul and Minneapolis, \$1.05, being reduced to 75 cents.

The rate on corn for export from Western points to the Atlantic Seaboard has been reduced to 15 cents per 100 lbs., Chicago to New York, the Managers of the Joint Traffic Association having made a recommendation to that effect on Jan. 15.

The Georgia Railroad Commissioners have refused the request of the drummers for an order requiring the rail roads to sell 1,000-mile tickets at three cents a mile. The Illinois Commissioners have taken similar action on a demand for a reduction in that State.

The Southwestern Passenger Committee gives notice that the members of the Southern States Passenger Association will join in making party rates only for bona fide members of regularly organized theatrical, operatic or concert clubs, glie clubs, brass bands, base ball clubs and football teams.

In the New York Supreme Court at Watertown a passenger has secured a verdict of \$60 damages against the New York Central for refusing to accept coupons from a mileage book on the train. The passenger based his claim on the fact that the ticket office was closed, thus making it impossible for him to change his coupons for a ticket.

Exports of Live Stock.

The *Journal of Commerce*, quoting from Government records, reports the number of head of cattle exported from this country in 1896 as 369,302. The largest number sent out from any one port was 153,353, from Boston, which is only about 3,000 less than the largest number ever exported from a single port (161,156 from New York in 1894). The exports from the principal ports for the past two years have been:

	1896	1895
Baltimore.....	59,833	39,514
Boston.....	153,353	115,351
New York.....	123,763	98,288
Philadelphia.....	19,353	16,404
Portland, Me.....	6,400	1,650
New Orleans.....	117	10
San Francisco.....	112	172
Northern Border Districts.....	771	240
Total.....	369,302	271,629

Practically all the cattle sent across the Atlantic go to Great Britain, though it is understood that a good deal of beef exported from England to Germany comes from American cattle.

Chicago Traffic Matters.

CHICAGO, Jan. 19, 1897.

The cutting of rates by the Soo line on merchandise westbound from the seaboard to St. Paul and Minneapolis has created consternation among the Chicago-St. Paul lines, who at present under the new regime can act only through the Western Freight Association. The Board of Managers has taken up the matter with President Van Horne of the Canadian Pacific.

Western Passenger Agents are breathing more freely, the Railroad Commissioners of Illinois having knocked the two-cents-a-mile agitation in the head. This matter settled, it is now given out that the Western Passenger Association lines will go ahead and agree on a new mileage ticket.

Complaint having been made to the Board of Managers of the Western Freight Association that drayage charges (as authorized by the Trans-Missouri Freight Committee) were being applied to equalize the customary switching charges within the territory of the Western Freight Association, members have been notified that such application at Missouri River points, or at any points within the jurisdiction of the association, must be discontinued.

Eastbound shipments from Chicago and Chicago junctions to and beyond the Western termini of the trunk lines for the week ending Jan. 14 amounted to 86,309 tons, as compared with 72,584 tons for the preceding week. This statement includes shipments of 37,939 tons of grain; 11,980 tons of flour and 10,821 tons of provisions, but not live stock. The following is a statement in detail for the two weeks:

Roads.	WEEK TO JAN. 14.		WEEK TO JAN. 7.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio.....	7,393	8.6	6,784	9.3
C. & C. & St. Louis.....	7,216	8.4	8,007	11.1
Erie.....	5,891	6.8	5,294	7.3
Grand Trunk.....	6,424	7.5	5,832	8.0
L. S. & M. S.....	15,083	17.5	10,572	14.6
Michigan Central.....	12,946	15.0	12,337	17.0
N. Y., Chi. & St. L.....	7,413	8.6	5,474	7.5
Pitts., Cin. & St. Louis.....	7,434	8.6	7,561	7.7
Pitts., Ft. Wayne & Chicago.....	11,404	13.2	7,658	7.6
Wabash.....	5,025	5.8	5,023	6.7
Totals.....	86,309	100.0	72,584	100.0